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The Nature and Predictors of Job Related Tension in a Crisis Situation: Reactions of Nuclear Workers to the Three Mile Island Accident[1]

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This study examines the nature of job tension among nuclear workers (N = 622) at Three Mile Island and a control plant during the TMI accident. Findings reveal three tension components (quantitative overload, role conflict, qualitative overload) and much higher levels of tension at TMI. The largest interplant difference occurs on conflict.

A general need exists to use "natural experiments" as a basis for advancing understanding of job stress and tension (Cooper & Payne, 1978). More specifically, Kasl (1978) points to using natural experiments that involve highly unsettled organizational situations as a means of gaining increased understanding of the dynamics of job related stress. Because individual coping responses may reduce tension in normal settings to comparatively low levels, it is important to conduct studies under conditions that generate substantial degrees of stress (McGrath, 1976).

The March 1979 accident at the Three Mile Island (TMI) nuclear plant provided a unique opportunity for studying the impacts of a major crisis on organizational members. Evidence indicating that the situation was widely perceived as a severe crisis includes: (1) the description of the accident by the President's Commission on the Accident at Three Mile Island as the worst crisis in the history of the U.S. nuclear industry (*Report of the President's Commission*, 1979); (2) the Commission conclusion that although the radiation effects on the physical health of individuals will be negligble, "the mental stress to which those living within the vicinity of the Three Mile Island were subjected was quite severe" (*Report of the President's Commission*, 1979, p. 13); (3) the finding that 60 percent of the residents within a 5-mile radius of the plant evacuated the area during the crisis (Munzenrider & Flynn, 1980). In addition, several previous studies (Kasl, Chisholm, & Eskenazi, 1981a, 1981b; Chisholm & Kasl, 1982) show that the accident affected TMI nuclear workers on a broad range of psychological variables. Therefore, it is crucial to attempt to gain greater understanding of the impact of this unique situation on the tension that nuclear workers experienced during the incident.

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[1] The study was conducted as part of the activities of the Behavioral Effects Task Group, under the Charter for the President's Commission on the Accident at Three Mile Island. The authors gratefully acknowledge the assistance of members of the Task Group, particularly its chairman, Bruce P. Dohrenwend, and Raymond L. Goldsteen, who was responsible for the field work. Jacob I. Fabrikant and Lloyd Corwin of the Public Health and Safety Task Force provided invaluable assistance in getting the study started. The authors also thank Robert F. Munzenrider for his advice on data analysis and two anonymous reviewers for their constructive comments on earlier versions of this paper.

From a theoretical viewpoint, it appeared that a variety of factors might contribute to the increased tension of nuclear workers during the accident period. Disaster studies (Baker & Chapman, 1962; Lindemann, 1944; Logue & Hansen, 1980; Melick, 1978) have amply documented the impact of disaster situations on symptoms of distress and on psychophysiological functioning, sometimes in large proportions of the affected populations. Although these studies provide a general theoretical base for the current study, the kinds of disasters typically studied—floods, hurricanes, explosions—differ distinctly from several psychological dimensions of the TMI accident. For example, typical disasters have more clear-cut time boundaries, with definable beginning and end points. Moreover, physical evidence provides information about the nature and extent of the danger and may suggest suitable coping and avoidance strategies. In contrast, the time boundaries of the TMI incident were highly ambiguous (e.g., any possible contribution of increased radiation dosages to higher incidences of cancer would take years to emerge and any cause/effect relationship would be impossible to establish), and the lack of physical signs made individuals highly dependent on "official" information through the media without any means of cross-checking its accuracy. Thus, the accident had undefinable dimensions and unclear boundaries.

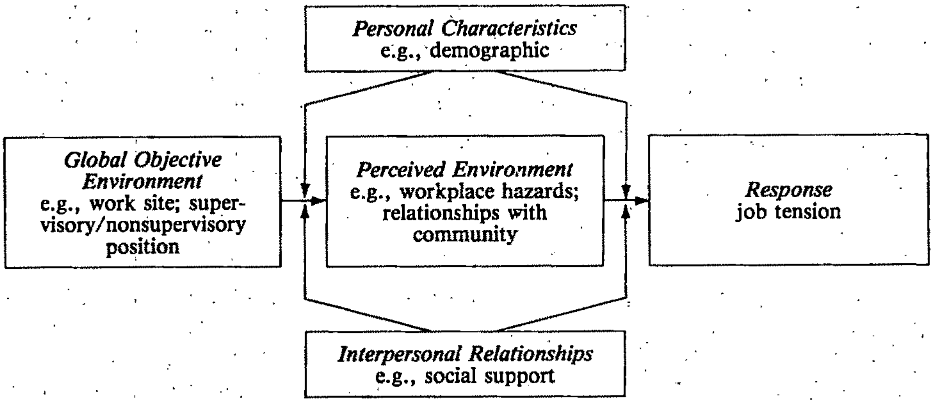
A second theoretical perspective, occupational health and organizational behavior, is relevant because of the special status of the nuclear workers. Because the TMI workers were permanent members of the organization that experienced the accident, they had both a psychological and an economic stake in its outcome and, to varying degrees, these workers were directly involved in the accident and had responsibility for controlling the plant and bringing it to a safe condition. Thus, the literature on occupational stress, work demands, and hazards in the workplace (Caplan, Cobb, French, Van Harrison, & Pinneau, 1975; Cooper & Payne, 1978; Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964) provided an additional theoretical framework and source of measures.

In addition to research areas suggested by the disaster and occupational health/organizational behavior literature, it was imperative to identify other potential key variables that derived from the uniqueness of the situation. Knowledge of the accident situation and preliminary results from earlier studies of residents in communities near TMI assisted in answering the question, what could the accident mean to nuclear workers? Thus, several sets of variables were added to the survey. For example, it appeared that nuclear workers would find themselves in a particularly difficult situation because of the multiple role demands placed on them. Conflict between married employees' concern about the health and safety of their families versus the need to stay in the workplace and fulfill work role requirements seemed particularly worth examining. Conflict also might arise between information the person received as an employee in the workplace and that which public officials were disseminating to the general population. In short, nuclear workers were involved in the accident situation both as members of the general population and, more directly, as employees of TMI. Therefore, it was essential to examine key aspects of likely worker experiences from both perspectives (Cooper & Marshall, 1977). Hence the study probed nuclear workers' perceptions of relationships with the larger community, the workplace, and linkages between these two life spheres.

Various writers have noted the lack of consistency in terms describing job tension, stress, and related concepts (Cooper & Marshall, 1976; Parasuraman & Alutto, 1981). For example, Cooper and Marshall (1976) state that the term stress has been used to denote environmental factors that impact the individual, the immediate effects of these impacts, and the person's reactions to stressors. Schuler defines stress as "a perceived dynamic state involving uncertainty about something important" (1982, p. 6). McGrath (1976) states that stress involves an interaction of person and environment. Something happens "out there" that presents a person with a demand, or a constraint, or an opportunity for behavior. Following McGrath (1976) and several previous studies (Kahn et al., 1964; Quinn, Seashore, Kahn, & Mangione, 1971), the present study defines job tension as the psychological reaction of workers to disturbances in the objective or perceived work environment.

The theoretical model of the Institute for Social Research (Caplan et al., 1975; Katz & Kahn, 1978; LaRocco, House, & French, 1980) was used to help identify and organize variables (see Figure 1). According to this model, job related tension constitutes one type of affective worker response to features of the global objective environment and the perceived environment. The global objective environment is that which exists independently of a person's perceptions of it (e.g., occupation, work location) (Caplan et al., 1975). The perceived environment refers to Lewin's (1951) "psychological environment," which results from an individual's perceptions and cognitions of the objective external environment (e.g., perceived workplace hazards) (Caplan et al., 1975). Relationships between variables in the objective and perceived environments and response variables may be moderated

Figure 1
Model of Contributors to Job Tension[a]


Personal Characteristics
e.g., demographic
Global Objective Environment
e.g., work site; supervisory/nonsupervisory position
Perceived Environment
e.g., workplace hazards; relationships with community
Response
job tension
Interpersonal Relationships
e.g., social support

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[a] Adapted from Katz and Kahn (1978).

by enduring properties of the person (e.g., demographic characteristics) or by interpersonal relationships (e.g., social support) (Katz & Kahn, 1978).

The present study examines stress related reactions of employees in a highly charged, ambiguous situation and identifies dimensions of experienced tension. The study also attempts to isolate specific variables in the objective and perceived environments that contribute independently to workers' job related tension.

Methods

The methods of this study reflect the practical constraints under which the research was carried out. The constraints were chiefly those of time and of personnel. A design was selected that called for a telephone survey of TMI workers and of employees at a "control" nuclear plant that, of course, had not experienced a comparable accident.

Sample

The sample of workers included all employees on the payroll of Metropolitan Edison Company who were assigned permanently to the Three Mile Island Plant on the accident date (March 28, 1979). The survey did not cover contractor personnel or company employees who were assigned temporarily to TMI during the accident. Nuclear workers permanently assigned to the Peach Bottom (PB) plant of the Philadelphia Electric Company served as a comparison group. This plant is located approximately 40 miles from TMI.

A total of 324 TMI workers and 298 workers from PB participated in the telephone survey, conducted in August and September 1979. These represent response rates of 60.8 percent at both plants (324 of 533 employees at TMI; 298 of 490 at PB). Nonrespondents include both interview refusals and individuals who could not be reached by the cut-off date for collecting data (e.g., workers away on vacation, impossible to find a convenient interview time, incorrect phone numbers). Records indicate that 51.2 percent of the 209 TMI nonrespondents and 62 percent of the 192 PB nonrespondents were failures to make a contact despite at least two or three attempts.

Procedure

Data were collected during a one hour telephone interview with each participant. A growing body of evidence from studies of health and behavior indicates that telephone interviews can provide as valid and reliable information as face-to-face interviews or mailed questionnaires (Groves & Kahn, 1979; Hochstein, 1967; Lucas & Adams, 1977). Underrepresentation due to excluding nontelephone households was not a problem because virtually every eligible subject had a phone.

Before phone contact each employee received a letter from the principal researchers. This letter explained the general nature of the study, guaranteed anonymity of responses, and indicated that an interviewer would be phoning in a few days. The letter also emphasized the importance of the study, the cooperation of the companies, and, in the case of TMI bargaining unit employees, the support of the union. The voluntary nature of participation also was stressed.

Interviews were conducted by trained interviewers who used a standard guide for asking questions and recording data. Most items on the interview schedule were fully structured with precoded answer alternatives. Random follow-up phone calls were used to verify that respondents had been contacted and to monitor the quality of interviews.

Variables

Demographic Characteristics. The study included measures of several standard demographic characteristics of employees (e.g., age, sex, marital status, education, income). Descriptive statistics on these variables appear in Table 1. In addition, because preliminary analysis of the data found relationships between three of these variables and job related tension, these measures (age, sex, having a preschool age child living at home) were used in the multivariate analysis.

Measures of Objective Environment. Kasl (1978) and McGrath (1976) note the sparseness of research evidence on the impact of the objective environment on tension. Hence, several measures were selected to measure basic characteristics of the global objective environment in which nuclear employees functioned during the accident (e.g., employment site, TMI v. PB; whether the respondent actually worked during the crisis period). Because higher levels of tension may be an inherent part of supervisory jobs

(Kahn et al., 1964), supervisory/nonsupervisory status was included as another indicator of the objective environment. Respondents also indicated whether there were times during the incident when it was impossible for them to perform job duties, another potential contributor to job tension. In addition, TMI employees indicated the location of their workplace within the plant during the crisis period (Unit 2, the location of the damaged reactor, v. other locations in the plant). Unit 2 presumably provided an objectively more hazardous work environment than did other parts of the TMI plant. Residential distance from TMI also was included because an earlier study showed that proximity to the plant affected general population members' reactions to the accident (Dohrenwend, Dohrenwend, Kasl, & Warheit, 1979).

Previous analysis (Chisholm & Kasl, 1982) found no extensive impacts of functional work group membership on worker reactions to the accident. However, work group membership still may contribute independently to job tension when the effects of other predictor variables are controlled. General knowledge of workplace conditions at the accident site and discussions with a nuclear expert resulted in a categorization of respondents' jobs into work groups based on a presumptive stress level of each function at TMI during the accident (group 1 = highest; group 4 = lowest). This categorization comprises a final measure of the global objective environment.

The Perceived Environment. Exposure to perceived workplace hazards is one basic indicator of how employees experienced the accident. Employee perceptions were obtained from a slightly modified version of a 12-item list of common workplace hazards (e.g., dangerous chemicals, dangerous work methods, too much noise) used in earlier national surveys (Quinn & Staines, 1979). Respondents first indicated if the job exposed them to these hazards (yes/no); those who answered positively then indicated the size of the perceived hazard (1 "no problem at all," 5 "great problem"). Nuclear workers responded twice to the workplace hazards scale: first, describing the six months before the TMI incident; the second time describing the situation during the TMI incident (March 28, 1979–April 11, 1979 was considered to be the accident period).

Several items or scales were designed to tap additional dimensions of the perceived environment during the accident period. These measures are described more fully in Kasl et al. (1981a, 1981b).

Job Tension. A 19-item scale, a modified version of the Kahn et al. (1964) instrument, was developed. Respondents reported the degree to which various dimensions of the job situation had bothered them during the accident period. Reliability analysis revealed high internal consistency (alpha coefficients) of the items (supervisors: TMI = .88, PB = .93; nonsupervisors: TMI = .86, PB = .91).

Evacuation Behavior. Withdrawal from stressful situations is a common means of coping with tension (Kahn et al., 1964). Hence, several items measured the evacuation behavior of nuclear workers and their families (if applicable). Specific measures covered whether the employee, employee's spouse (married respondents only), and children (if any) left the area at any time during the incident and the reasons for not leaving the area (if applicable).

Limitations of the Study Design. Several limitations of the research design, discussed more extensively elsewhere (Kasl et al., 1981a), require brief mention here. Disaster research is necessarily opportunistic, quasi-experimental, and after-the-fact. The study falls in the "static-group comparison" category (Campbell & Stanley, 1966), which is considered one of the weaker research designs (Cook & Campbell, 1976). However, the weaknesses are potential and establishing their existence (or absence) requires careful examination of the unique circumstances surrounding a particular study.

Two specific issues should be noted. First, this was a one-shot survey, conducted five to six months after the accident; hence, conclusions regarding impact are tied to this point in time and should be considered strictly as "impact at six months." Collecting data at different points in time might have affected participants' recollections of the accident and descriptions of their present status. Second, the logic of inferring effects of the accident from differences in outcome variables between TMI and PB workers depends on the assumption that the two groups of nuclear workers are essentially equivalent, except for the exposure of the TMI workers to the accident. In the "static-group comparison" design, the two major potential weaknesses depend on biased selection and biased attrition (Campbell & Stanley, 1966). A careful review of circumstances involved in the present case leads one to conclude that neither is a serious or highly plausible problem (Kasl et al., 1981a).

It must be noted also that although PB workers were not "exposed" to the accident, they certainly could have been affected by it. Consequently, the present design can detect only the differential impact of the accident on TMI versus PB workers. The "absolute" effect of the accident ("before-after" change) cannot be detected, and the absence of a difference between the two plants could mean that nuclear workers in both settings were affected equally.

Results

This paper covers two general types of survey results. The first type involves reporting descriptive statistics on variables included in the study. The second type of result stems from the hierarchical multiple regression of job tension with the independent variables (objective environment, demographic variables, perceived environment) used as predictors.

Description of Study Samples and Their Comparability

Table 1 presents the descriptive data on the study samples, broken down by supervisory status. The main issue is the comparability of PB and TMI subjects within the supervisory and nonsupervisory strata. Statistical analysis

Table 1
Characteristics of Study Samples and Objective Environment

	Supervisory		*Nonsupervisory*	
	TMI	*PB*	*TMI*	*PB*
Participation rate (% target population)	66.3	81.4	58.3	52.6
Number of subjects interviewed	110	114	212	181
Percent female subjects	6.4	.9	12.3	3.9
Percent married	87.3	85.8	79.2	83.4
Percent living in single family homes	86.4	91.2	69.8	82.2
Mean age	34.9	41.5	33.4	32.8
Mean number of children (≤ 18) living at home	1.8	1.9	1.7	1.8
Percent with child ≤ 5 at home	33.6	19.3	26.4	42.5
Mean years of schooling	14.3	14.3	13.0	13.2
Mean number of years lived in (PB, Harrisburg) area	13.4	14.9	19.9	13.6
Mean number of years worked at (TMI, PB)	5.24	7.85	4.15	4.77
Years on *present* job (% ≤ 1 year)	22.7	17.5	19.8	22.7
Percent working full time at interview time	98.2	100.0	96.2	98.3
Mean 1978 income on present job[a]	22,600	29,700	19,600	24,700
Present family economic situation compared to 6 months ago (4 items: 1 = worse, 3 = better)				
Mean	2.29	2.36	2.34	2.33
S.D.	.42	.42	.41	.41
Relative economic deprivation (2 items: 1 = favorable, 5 = unfavorable)				
Mean	1.78	1.70	1.80	1.81
S.D.	.51	.49	.59	.55
Working at TMI (PB) plant during the incident (3/28/79-4/11/79)				
% Yes	98.2	82.5	94.8	84.1
Work location in plant, *TMI employees* only				
% Unit 2 or both units	51.8	—	50.5	—
During the incident were there any times at work when you were unable to carry out your job duties?				
% Yes	29.1	4.7	19.8	1.8
Significance	$p < .001$		$p < .001$	
Distance of home from TMI plant				
% ≤ 5 miles	33.0	0.0	39.3	.6
% ≥ 50 miles	.9	52.3	.5	49.7

[a] Approximately 30 percent of respondents have missing data; the great majority of these had not been in their present job throughout 1978.

using chi-square and *t*-tests, respectively, revealed only two differences between the plants: more female workers at TMI when supervisors and nonsupervisors were combined and older workers among PB supervisors.

The older age of PB supervisors apparently reflects that the PB plant is several years older than TMI. Different hiring practices at the start also may have reduced female employment. Income differences largely disappear when one takes into account overall seniority, years on present job, and sex. The subjective economic data reveal the PB and TMI groups to be virtually identical.

It is crucial to note that virtually all respondents were working full time at the time of interviews. Hence, there is little chance that lay-offs confounded the impacts of the accident. The lack of a PB-TMI difference on "present family economic situation, compared to 6 months ago," supports this conclusion.

The last four items in Table 1 cover dimensions of the global objective environment, which are discussed later.

Job Tension

Analysis of responses to the job tension scale indicates that TMI nuclear workers experienced significantly higher overall tension on their jobs during the incident than did PB employees. This difference exists for both supervisors and nonsupervisors based on mean responses to the total scale (supervisors: TMI $\overline{X} = 1.86$, *S.D.* = .59; PB $\overline{X} = 1.45$, *S.D.* = .57; nonsupervisors: TMI $\overline{X} = 1.75$, *S.D.* = .54; PB $\overline{X} = 1.37$, *S.D.* = .49; $p < .001$ in both cases); and the proportion of respondents who answered "never" to all items (supervisors: TMI = 5.5 percent, PB = 34.3 percent; nonsupervisors: TMI = 8.7 percent, PB = 41.9 percent; $p < .001$ in both cases).

Job related tension may be comprised of several underlying components (e.g., quantitative overload, conflict) (Kahn, 1974). However, comparatively little work has been done to establish the empirical bases for such differentiation. A varimax rotation of scale items for the entire sample population ($N = 622$) was conducted (see Table 2). Individual item factor loadings appear only if they equal or exceed .40.

Three factors with eigenvalues ≥ 1 emerge, and these factors account for approximately 51 percent of the variance in the job tension scale. These factors also have relatively clear interpretations based on existing theory. The first factor consists of seven items that comprise quantitative overload (Sales, 1969). Four items (3, 11, 14, and 17) clearly connote the overload concept, and three of these have the most robust loadings on the first factor. It also is reasonable to interpret the other three items (conflicting demands of superiors, required to do things against better judgment, and job interfered with family life) as contributing to a sense of being overloaded by stimuli in the work environment. Factor two includes items 1, 2, 6, 7, 9, 10, 16, 19, which reflect role conflict: receiving ambiguous and/or conflicting expectations from others at work (Wells, 1982). Qualitative overload (French & Caplan, 1972; French, Tupper, & Mueller, 1965) comprises the core dimension among items 5, 15, and 18. The eighth item did not load sufficiently to be included in any factor.

Based on the factor analysis, three scales were created by adding the individual items with the highest loadings on each factor. Tests for internal reliability yielded alpha coefficients of .83 for quantitative overload and conflict, .65 for qualitative overload. Comparable levels of internal reliability remain when data are broken down by plant site: alpha coefficients of .79, .79, and .62, respectively, at TMI; .86, .84, .66, respectively, at PB.

Correlation analysis (see top portion of Table 3) shows that some overlap exists among the three factor scales, with the greatest overlap between the first two factors. However, analysis by plant site indicated considerably less overlap between the three factors at TMI (range of *rs* = .44 to .56) than at PB (range of *rs* = .58 to .75). Overall these relationships among factors

Table 2
Varimax Rotation of Job Tension Scale Items[a]

All of us occasionally feel bothered by certain kinds of events at work. I am going to list things which sometimes bother people at work. Please indicate how often *each of these* bothered you *while* on the job *during the TMI incident (3/28/79-4/11/79). Response categories: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Rather Often; 5 = Nearly all the Time.*

	Factors			
Item	*I*	*II*	*III*	*Communality*
During the TMI incident did you feel (were you):				
1. *Too little authority* to carry out assigned responsibilities?		.56		.38
2. *Unclear* on scope and responsibilities of your job?		.51		.38
3. *Too heavy* a workload, one that you couldn't possibly finish in an ordinary workday?	.68			.49
4. Unable to satisfy *conflicting demands* of superiors?	.52			.47
5. *Not fully* qualified to handle your job?			.58	.43
6. Unclear about your *supervisor's* evaluation of your performance?		.51		.33
7. You could not get *information* needed to carry out your job?		.51		.45
8. You had to decide things that would *affect others' lives*?				.13
9. Unable to *influence supervisor's* actions?		.54		.46
10. Unclear about *co-workers' expectations* of you?		.56		.44
11. The *amount of work* interfered with how well it got done?	.65			.53
12. You had to do things that were against your *better judgment*?	.41			.39
13. Your job tended to interfere with your *family life*?	.46			.41
14. Too much *responsibility* and *authority* delegated by supervisors?	.46			.40
15. The *quality of work* expected was too difficult?			.45	.36
16. Your work assignments were *too easy*?		.51		.28
17. You had an *overwhelming work load*?	.75			.59
18. Job demands required more *training* or *knowledge* than you had?			.69	.55
19. Lack of enough *support* from your *supervisor*?	.40	.52		.50
Eigenvalue	7.0	1.5	1.1	
Percent of variance	37.0	7.7	6.0	
Cumulate percent of variance	37.0	44.7	50.7	

[a] Only items loading ≥ .40 are reported.

are somewhat higher than desirable. However, the relative clarity of factors and the possibility of finding that different dimensions of the crisis situation affect different components of job tension led to a decision to use the three factors in further analyses. Analyses also use the total 19-item scale to measure overall job tension.

Two basic findings emerge from a comparison of mean responses of nuclear workers on the three factors reported in the bottom segment of Table 3. TMI employees reported considerably higher levels of tension on each of the three factors, and the differences in means are highly significant statistically ($p < .001$). However, the higher level of overall job tension that supervisors (versus nonsupervisors) experienced during the incident results from quantitative overload (Δ means = .19, $p = .005$), not from differences on the other two factors.

Table 3
Pearson Correlation Coefficients Among Job Tension Factors and Mean Values

	Correlation Coefficients					
	Ambiguity/Conflict			*Qualitative Overload*		
	All S's	*TMI*	*PB*	*All S's*	*TMI*	*PB*
Quantitative overload	.66	.56	.75	.53	.44	.58
Conflict				.55	.44	.68

	Means of Job Tension Factors													
	All S's *(N=622)*[a]		*TMI* *(N=324)*[a]		*PB* *(N=298)*[a]		*TMI/PB*	*Supervisory* *(N=224)*[a]		*Nonsupervisory* *(N=393)*[a]		*Supervisory/ Nonsupervisory*
	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	Δ	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	Δ
Quantitative overload	1.72	.74	1.90	.72	1.51	.70	.39**	1.84	.82	1.65	.68	.19*
Conflict	1.59	.65	1.80	.68	1.34	.51	.46**	1.58	.62	1.59	.66	.01
Qualitative overload	1.42	.59	1.52	.61	1.29	.53	.23**	1.41	.63	1.42	.56	.01

[a] *N*s may be slightly reduced due to occasional missing data.
*$p = .005$
**$p < .001$

Objective Environment

The most basic distinction between environments involves location of the plant (i.e., TMI v. PB); the second key distinction is supervisory/nonsupervisory status (see Table 1). Another item covered whether or not the respondent actually worked at his (her) respective work site during the 15-day crisis period. Results reported in Table 1 show that a higher proportion of workers at TMI (v. PB) were working at the nuclear plant during the period. Presumably the noncrisis situation at PB made it possible for employees to be absent for legitimate discretionary reasons (e.g., vacations). About half (51 percent) of the TMI respondents worked in Unit 2, the damaged reactor location, during the accident period.

It was expected that workplace factors such as excessive radiation might, at times, prevent employees at the accident site from carrying out their job duties. Findings show that a much higher percentage of both supervisors (TMI = 29.1 percent, PB = 4.7 percent, $p < .001$) and nonsupervisors (TMI = 19.8 percent, PB = 1.8 percent, $p < .001$) at TMI reported that they were unable to conduct their job duties at times. A substantial number of TMI supervisors (33 percent) and nonsupervisory employees (39.3 percent) lived within five miles of the plant. As expected, virtually no PB employees lived within the five mile radius of TMI; approximately half of them lived at least 50 miles from the accident site. Overall, these findings show clear differences between employees at the two plants on available measures of the global objective environment.

Perceived Environment

High proportions (70 percent to 90 percent) of supervisors and nonsupervisors at both nuclear plants felt that their companies kept them fully apprised of health hazards; the TMI-PB differences are small and lack statistical significance. However, the difference between PB and TMI is significant when the supervisory and nonsupervisory groups are combined, TMI employees feeling less informed. Perceptions of the truthfulness of information from state and federal government officials were low; about one-third of the PB workers perceived this information to be truthful, and the corresponding proportion at TMI was lower, although not significantly so. TMI nonsupervisors (v. PB) were considerably more likely to feel that their job affected their decisions during the accident period ($\Gamma = .38$, $p < .001$).

Substantially greater proportions of TMI supervisors (38 percent v. 2.8 percent at PB; $p < .001$) and nonsupervisors (49 percent v. 6.1 percent at PB; $p < .001$) also perceived increased danger to their health during the incident. In addition, TMI employees felt that their responsibility to report for work during the accident had a substantially greater effect on decisions than did their PB counterparts.

Employees at the two sites perceived the general community evaluation and appreciation of their performance during the incident to be somewhat negative. However, the mean responses to this scale show no differences between employees at the two work sites.

Two items measured perceived exposure to radiation hazards. For the preaccident period, PB and TMI workers are virtually identical; a slight difference indicates fewer reports of problems among the TMI workers. In both settings, supervisors perceived less of a problem than did nonsupervisors. During the accident period, TMI workers report more problems (supervisors: $\Gamma = .27, p < .01$; nonsupervisors: $\Gamma = .30, p < .001$). Responses indicate that, overall, approximately 43 percent of the TMI workers experienced greater exposure to radiation hazards during the accident period versus six months prior to the accident. This result contrasts sharply with the approximate 5 percent increase among PB employees (supervisors: $\Gamma = .62, p < .001$; nonsupervisors: $\Gamma = .75, p < .001$).

Findings indicate that the accident did not affect the perceptions of exposure to other work hazards. The only significant differences are on "risk of catching diseases," for which the PB nonsupervisory workers report greater hazards for both occasions; clearly, this is unrelated to the accident.

Responses to two other questions also show clearcut interplant differences. About five times as many TMI (v. PB) supervisors and approximately three times as many nonsupervisors at the accident site felt the need to be in more than one place concurrently. In addition, members of both TMI employee groups had higher rates of conflict with their spouses than did PB workers.

Several general findings emerge regarding employee evacuation behavior: (1) Although evacuating the area was not a common response to the accident by nuclear workers, nonsupervisory employees at TMI did leave at about twice the rate of their PB counterparts (10.8 percent v. 5 percent, $p < .05$); (2) Much higher proportions of TMI (v. PB) spouses and children left their living areas during the crisis period (30 percent v. 5 percent, $p < .001$). Work attachment ("had to work") was a primary reason why TMI employees and their spouses did not leave their homes at the time of the accident. These responses suggest that TMI workers had concern about their own safety and about that of their families. However, feeling the responsibility of work apparently restrained evacuation of employees and family members.

Predictors of Job Tension

To help determine key variables that made significant independent contributions to job tension, hierarchical multiple regression analysis was conducted. The prescribed order follows the general categorical sequence of the ISR model (Caplan et al., 1975; Katz & Kahn, 1978). (Details are available from the authors.) "Dummy variables" were created for all nominal independent variables (Kerlinger & Pedhazur, 1973).

Preliminary multiple regression analysis included the entire list of potential predictors. Variables that contributed relatively little to the variance of job tension were eliminated for each successive data run, and analysis continued until all remaining variables had a statistically significant impact (F tests of partial beta weights, $p \leq .05$) on the dependent variable. Table 4 gives findings for TMI employees. Among TMI supervisors three variables (employer kept fully informed, workplace hazards during the accident, need to be in two places) appear to make important contributions to overall job tension and quantitative overload (multiple $R = .48$ and .51, respectively). Working in Unit 2, the damaged reactor location, and perceived radiation hazards associate with conflict (B = -.26 and .29, respectively). The perceived general work place hazards variable predicts qualitative overload (B = .37, $R^2\ \Delta = .14$), and age relates inversely to this tension component (B = -.22, $R^2\ \Delta = .07$). Thus, no general predictors that cut across the three tension factors exist among TMI supervisors.

The bottom segment of Table 4 presents findings for TMI nonsupervisors. Again, the effects of predictor variables tend to be limited to a single factor with no independent variable affecting all three tension components. Perceived workplace hazards have the strongest association with overall job tension (B = .33, $R^2\ \Delta = .12$) and quantitative overload (B = .33, $R^2\ \Delta = .13$). This variable also correlates with conflict (B = .29, $R^2\ \Delta = .07$). Employees who felt the need to be in two different locations (typically work v. home) were more likely to experience greater quantitative and qualitative overload (B = .22 and .24, respectively). Surprisingly, belonging to a functional work group with higher estimated stress potential (e.g., operations) predicts lower quantitative overload. In contrast, employees who stated that they would have taken different actions if not working in their current jobs experienced greater quantitative overload. Being unable to perform normal job duties at times during the incident associates with increased conflict (B = .19); believing that the employer provided full information about hazards relates to lower levels of conflict (B = -.27, $R^2\ \Delta = .13$). Employees who lived within five miles of TMI reported lower levels of conflict and qualitative overload. Perceived radiation hazards correlates only with qualitative overload (B = .33, $R^2\ \Delta = .15$). In general, distinct differences exist between variables that contribute to tension factors among supervisors and nonsupervisors at TMI.

Findings for PB supervisors in Table 5 indicate that two variables (having times when it was impossible to perform job duties and risking disease) predict all of the explained variance in overall job tension, conflict, and qualitative overload (multiple $R = .54$, .49, .56, respectively). Together these two independent variables also explain 19 percent of the variance of quantitative overload. Unlike TMI, stating that the employer kept workers completely informed about dangers has an inverse relationship to quantitative overload. Perceiving greater appreciation from the community associates with reduced quantitative overload (B = -.25, $R^2\ \Delta = .09$). This finding also is unique to PB supervisors. Overall, the set of predictor variables that contribute to the job tension of PB supervisors is quite different from that present for TMI employees. Because only one predictor (need to be two places concurrently) affects job tension or its components among PB nonsupervisors, results for this group are not reported in Table 5.

Table 4
Predictors of Job Tension Among TMI Nuclear Workers During the Accident

	Multiple R				*R²*				*Standardized Regression Coefficient*			
Variable	*Job Tension*	*Quantitative Overload*	*Conflict*	*Qualitative Overload*	*Job Tension*	*Quantitative Overload*	*Conflict*	*Qualitative Overload*	*Job Tension*	*Quantitative Overload*	*Conflict*	*Qualitative Overload*
Supervisors												
Work location (Unit 2 v. other)			.11				.01				–.26	
Age				.27				.07				–.22
Employer kept fully informed re dangers and unhealthful hazards	.27	.32			.07	.10			–.16	–.21		
Radiation hazard during			.28				.08				.29	
Workplace hazards during	.40	.40		.46	.16	.16		.21	.29	.22		.37
Need to be in two places at same time	.48	.51			.23	.26			.26	.32		
Nonsupervisors												
Functional work group		.17				.03				–.25		
Times unable to carry out job duties during accident	.17		.20		.03		.04		.14		.19	
Proximity of home to plant			.26	.13			.07	.02			–.15	–.13
Employer kept fully informed re dangers and unhealthful hazards	.37		.44		.14		.20		–.18		–.27	
Different action taken if not in current job		.30				.09				.16		
Radiation hazard during				.41				.17				.33
Workplace hazards during	.51	.47	.52		.26	.22	.27		.33	.33	.29	
Need to be in two places at same time	.54	.52		.47	.29	.27		.22	.20	.22		.24

Table 5
Predictors of Job Tension Among PB Supervisors During the Accident

Variable	*Multiple R*				*R²*				*Standardized Regression Coefficient*			
	Job Tension	*Quantitative Overload*	*Conflict*	*Qualitative Overload*	*Job Tension*	*Quantitative Overload*	*Conflict*	*Qualitative Overload*	*Job Tension*	*Quantitative Overload*	*Conflict*	*Qualitative Overload*
Times unable to carry out job duties during accident	.33	.29	.33	.39	.11	.08	.11	.15	.25	.19	.26	.31
Employer kept fully informed re dangers and unhealthful conditions		.29				.09				.25		
Appreciation of community		.42				.18				−.25		
Disease risk during	.54	.54	.49	.56	.29	.29	.24	.31	.48	.36	.37	.41
Need to be in two places at same time		.58				.33				.21		

Interaction Effects

Several 3-way analyses of variance were run with one or another of the key predictors identified above, plant location and supervisory status as independent variables and job tension as the outcome variable. These analyses focused on interaction effects to determine if different dynamics occurred at the two plants. In each case, reported findings indicate 2-way interaction effects after accounting for the impact of holding a supervisory or nonsupervisory position.

Results indicate that TMI/PB differences exist between the variable "employer kept (me) fully informed about any dangers" and overall job tension ($F = 13.7, p > .001$), qualitative overload ($F = 15.5, p < .001$) and conflict ($F = 9.3$, $p < .01$). Thus, receiving information to allay fears about threats to workers' physical well-being had a different effect in reducing job tension at TMI than at PB. Significant interaction also occurs between perceived radiation hazards during the accident and plant location with qualitative overload as the dependent variable ($F = 5.8$, $p = .02$). In short, the combined effects of employment at TMI and perceived radiation hazards on qualitative overload differ from these effects at PB.

Other interactions suggesting that different dynamics exist were found among being unable to perform normal job duties, plant location, and quantitative ($F = 4.2, p < .05$) and qualitative ($F = 7.9, p < .01$) overload. Interaction effects also were seen between appreciation by the community and plant location on quantitative overload ($F = 6.8$, $p < .01$).

Discussion and Conclusions

Several general conclusions emerge from the study: (1) The overall level of job tension was considerably higher at TMI than at PB; (2) Three job tension factors (quantitative overload, conflict, qualitative overload) seem to suggest themselves among nuclear workers; (3) TMI employees reported higher job related tension during the incident on each factor; (4) Independent variables that impact job tension and its components vary greatly between TMI and PB workers and, to a lesser degree, between supervisors and nonsupervisors at the accident site. Finding the largest TMI-PB difference on the second factor reflects the basic ambiguous, uncertain nature of the accident situation.

The larger number of significant predictors at TMI (v. PB) and the influence of these variables on one (or at most two) tension factor(s) suggests that the accident caused TMI employees to differentiate among various aspects of their environments and to focus more precisely on specific bothersome aspects of the total work situation. Instead of having a generalized reaction to perceived radiation hazards, for example, this independent variable influences only conflict for supervisors and qualitative overload among nonsupervisors at TMI.

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Demographic characteristics have little effect on job tension. In toto, measures of the objective environment have less impact on job related tension than dimensions of the perceived environment within each plant. However, dimensions of the objective environment that do affect tension deserve mention. For example, working in TMI Unit 2 decreases conflict for supervisors; working in a functional work group with higher estimated stress potential has the same effect on nonsupervisors' quantitative overload. Although the contribution of each independent variable is relatively small, the pattern is important because it dispels the straightforward notion that closeness to the danger source (the damaged reactor) leads to higher tension. In fact, such proximity tends to lessen several aspects of job tension. In addition, having periods of being prevented from carrying out regular job duties contributes to higher conflict for TMI nonsupervisors. It is reasonable to speculate that performing job duties enhanced employees' feelings of control over the work situation and thereby reduced ambiguity/conflict. Working nearer the damaged reactor (in Unit 2 or in a function with more direct contact with the damaged reactor) also may have provided direct cues (e.g., via observation, talking first-hand with others involved in coping with the accident) about the nature and dimensions of the crisis situation.

As expected, interrole conflict contributed importantly to TMI employees' job tension. This is apparent from the impact of "need to be in two places at the same time," because the vast majority of TMI workers (approximately 90 percent nonsupervisors and 75 percent supervisors) indicated conflict between being at work and at home during the incident. The finding that, among those who did not leave the area, high proportions of TMI workers did not evacuate because they "had to work" (supervisors 46 percent, nonsupervisors 39 percent) gives further evidence of the work role–family role conflict present during the incident. However, the lack of significant interaction effects by plant location suggests that this type of role conflict, although greatly exacerbated by the accident at TMI, is not unique to the crisis situation. Instead, perhaps work/home conflicts are an inherent part of the lives of nuclear workers, and the crisis situation merely heightened the level of the conflict but did not change the slope of the line. The continuous operation of nuclear plants (requiring three work shifts) and the need to have at least some employees "on call" while off duty to respond quickly to emergencies serve to interrupt normal social activities (Poulton, 1978) and probably contribute to this role conflict. Current findings support those of previous research (Kahn et al., 1964) that greater role conflict contributes to higher levels of job tension.

Earlier studies of the general population (Dohrenwend et al., 1979) found that, in general, the accident had stronger impacts on residents who lived within five miles of the accident site. However, the psychological reactions of TMI nuclear workers do not fit this pattern. For example, nonsupervisors who lived closer to the accident site experienced less conflict and qualitative overload. In addition, respondents who lived within five miles of the plant reported considerably more positive perceptions of community residents' views about nuclear workers and their performance during the incident (Kasl et al., 1981b). Several other "benefits" of living closer to the plant also emerged (e.g., higher job satisfaction, stronger identification with the company, higher occupational self-esteem) (Kasl et al., 1981b). Thus, general findings do not support the concept that workers who live close to the plant were particularly vulnerable to accident effects. Instead, it appears that living closer to the plant increases overlap between the work and nonwork (family/social life) spheres of nuclear workers' lives. This greater integration may result from self-selection (i.e., workers with stronger workplace attachment chose to live near the plant) and/or the consequences of dissonance reduction (i.e., changing one's attitudes to accommodate the reality of living under the "shadow" of a nuclear plant).

Cummings and Cooper (1979) identify "stress complexity" as a key dimension of the work environment because effective employee coping requires a matching between each type of stressor and the appropriate response to it. Determining the variety of "stresses" (stressors) in a given work environment provides a rough measure of its "stress complexity" (Cummings & Cooper, 1979). In the present study stressors are equivalent to the predictors of job tension. The larger number of significant predictors at TMI (v. PB) and the influence of these variables on one (or two) tension factor(s) suggest that the accident greatly increased the "stress complexity" of the TMI work environment, thereby reducing the ability of employees to adjust to the environment. Perhaps this increased complexity itself contributed to increased job tension beyond that attributable to specific independent variables. Examining the impact of a pattern variable (Khandwalla, 1977) such as "stress complexity" is beyond the scope of the current study. However, devising ways of attempting to measure the effects of this phenomenon in future crisis situations seems warranted.

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The Motivational Effects of Participation Versus Goal Setting on Performance[1]

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The motivational effects of participative decision making (PDM) in work strategies versus goal setting were examined in performance of college students assigned to a toy assembly project. The results showed a significant main effect for goal setting only; goal setting led to performance that was significantly higher than that which occurred in the "do best" conditions. The interaction effect between goal setting and PDM was not significant.

This study is the eleventh in a series of experiments that were designed to assess the effectiveness of participation and goal setting on performance. The series had as its impetus the early field studies by Coch and French (1948) and Meyer, Kay, and French (1965), as well as the theoretical work of Locke (1968).

Coch and French found that participation in job redesign in a pajama manufacturing plant was effective in increasing productivity levels over levels that occurred when employees were allowed no say in the redesign of their jobs. Employee participation also led to greater increases in productivity than those occurring when employee delegates or representatives participated in the decision making on job redesign. In short, performance was directly proportional to the amount of employee participation in decision making.

A primary limitation of this study from a pragmatic standpoint is that it could not be replicated (Fleishman, 1965; French, Israel, & Aas, 1960). A primary theoretical limitation of the study was that the participation included goal setting. Thus, the extent to which participation would have affected performance in the absence of goal setting is not clear. Goal setting theory (Locke, 1968) states that participation can affect motivation only to the extent that it influences a person's goals (e.g., acceptance/commitment). Consequently, much subsequent research has focused on participation as a method for setting goals.

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Meyer (French, Kay, & Meyer, 1966; Meyer et al., 1965) studied managers who received performance appraisals at the General Electric Company. He found that, to improve performance, how a goal is set (assigned/participative) is not as important as that a specific goal, in fact, is set. However, as noted by Latham and Yukl (1975a), a number of factors make it difficult to reach any conclusions from this study. For example, the participation manipulation was not always successful, there was no objective performance measure, and the conclusions reached were not always supported by statistical tests of significance.

As a result of this pioneering work on goal setting and participation, as well as management's interest in ways of increasing productivity, seven field studies (Dossett, Latham, & Mitchell, 1979; Latham & Marshall, 1982; Latham & Yukl, 1975b, 1976; Latham, Mitchell, & Dossett, 1978) and three laboratory studies (Latham & Saari, 1979a, 1979b; Latham, Steele & Saari, 1982) were conducted to examine the relative contribution of participative and assigned goal setting. In general, the results show that hard goals do in fact lead to higher performance than do easy goals, regardless of the method by which they are set. These studies provide strong support for the early work by Meyer and his colleagues (French et al., 1966; Meyer et al., 1965).

None of the above 10 studies, however, addressed the issue of participation as a variable independent of goal setting regarding its effect on performance. As Tolchinsky and King (1980) correctly pointed out, these studies have simply tested the effectiveness of setting goals in a participatory versus a nonparticipatory manner. Thus, one cannot conclude on the basis of these studies that participation as a variable in itself affects performance only through its effects on goals.

The purpose of this eleventh study was to manipulate independently, for the first time, the motivational effects on performance of participative decision making (PDM) in work strategy versus goal setting. The hypotheses of the present study were *(1) that goal setting would result in higher performance than urging people to do their best and (2) that PDM in work strategy would result in greater performance than telling people what to do.* The first hypothesis was based on Locke's (1968) theory of goal setting. The second hypothesis was based on modern organizational theory as espoused by Likert (1967).

Method

Subjects

Participating in the study were 72 (32 female, 40 male) college students. The mean age of the participants was 19.3 years (SD = 1.9). Each person received partial credit toward fulfillment of course requirements in an introductory psychology class. The students were randomly assigned to one of six conditions in a 3 × 2 factorial design. The two independent variables in this study were goal setting (participative, assigned, do best) and decision making (participative, assigned).

Task

The task selected for the study was a toy assembly project adapted from a business game used in an assessment center. This task was selected because it simulated a routine assembly job that is often encountered in small manufacturing firms. In addition, the task lent itself to the setting of specific goals as well as participative decisions as to how the task should be completed.

The task required participants to join together four identical pieces of precut construction paper with staples to form a specific shape, described as a toy. The objective of each person was to assemble as many toys as possible or to attain a specific goal, depending on the experimental condition, in the 20 minutes allotted.

Procedure

Each person worked alone at a work table in a small room. The experimenter was seated off to one side of the work table for the duration of the experimental situation. To avoid being obtrusive when not actually communicating with an individual, the experimenter was involved in quiet study. All the materials necessary to perform the task were available on the work table. In addition, a clock was visible for participants to keep track of their time. The clock was necessary because it enabled each person to measure his/her performance against a goal and/or time limit.

Each person was told that the task to be performed required manual dexterity, and that the experimenter needed a measure of his/her ability to perform this task to determine if he/she was suitable for continuing with the experiment. Thus, each person would be timed for four minutes on a pretest task.

The actual purpose of the pretest was to provide a measure of each person's ability. In testing for motivation effects, ability, if not controlled, becomes error variance. Thus, unless the motivational effects are extremely robust, the failure to control for ability could lead to inconclusive results.

After the experimenter explained the task to the subject and actually demonstrated how to assemble a toy, the experimenter asked the subject to build two toys just for practice prior to the premeasure. Each person was asked to stack completed toys off to one side of the workbench so that it would not be obvious exactly how many circles had been assembled during the four minute time period. This precaution was intended to reduce the ability of those people who were subsequently assigned to the "do-best" condition to set specific goals on the basis of their pretest performance. Everyone was asked to work as rapidly as possible during the premeasure period.

At the end of the four minute work period, the experimenter initiated the job simulation situation by instructing each person to imagine him/herself in an actual work environment and to think of him/herself as an employee in a small manufacturing firm that made toys for children. Each person was asked to consider the experimenter as the supervisor in the production department where the toys were assembled. The rationale given to the people for this job simulation was that the experimenter was interested in determining the ability of individuals to become involved in a role-playing situation to be used for predicting the future performance of job applicants for a toy assembly plant. Following the instructions, the experimenter manipulated the independent variables of goal setting and participation. After the 20-minute work period the experimenter collected the completed toys and gave the person a questionnaire to complete.

Manipulating the Independent Variables

Task strategy decisions were manipulated first, followed by goal setting. Three characteristics of the task were variable in order to allow conditions for decision making regarding task strategy.

In the participative decision making condition, the participants first were allowed to select one of three possible types of toys to assemble based on a cost and selling price list. Each person selected from these choices on the basis of personal preference (e.g., a perceived difference in the ease of handling parts during construction) or estimated market appeal (e.g., greater public appeal for a red "contemporary" toy box than for a green "classic" style toy box). A second decision involved the method of toy construction. Toys could be assembled as complete units or as subunits to be accumulated four at a time and joined to form two complete units. The third decision required of subjects in the participative decision condition was an unrestricted choice of when to schedule two one-minute rest breaks during the work period.

In the assigned decision condition the experimenter provided each person with the same amount of information as those in the participative condition. This was done to control for potential differences in job clarity and understanding that might affect performance (Latham & Saari, 1979b). Each person was assigned the task choice alternatives based on the alternatives selected by a prior subject in the participative condition.

In summary, the motivational effects of participation in decision making in the present study were isolated from the cognitive elements by imposing the ideas generated through PDM on participants who were randomly assigned to another condition. As a further safeguard to ensure that the cognitive effects of PDM regarding work strategy were not confounded with motivational effects, a pilot study was run to determine whether the choice of toy, construction, or rest break could affect performance. No effect on performance was observed.

Goal setting was manipulated as follows. Individuals in the participative goal setting condition were asked to set a specific, difficult, but attainable goal in terms of the number of toys that could be produced within the 20-minute work period. Each subject in the two goal setting conditions was told that studies have shown that specific, difficult, yet attainable goals result in increased performance as compared to simply doing one's best, and that for his/her department to be a success he/she needed to strive for maximum performance. Then, each subject in the participative goal setting condition was told how many toys he or she had assembled in the four minute pretest period and was encouraged to set a difficult but attainable goal. After deciding on a goal, each subject was asked if he/she was satisfied that the goal fit the description of "difficult, but attainable" and was asked to change the goal if desired.

In the assigned goal condition, the goal was based on a difficulty factor derived from a second pilot study ($N=30$) of subjects in a participative goal condition. That is, each person's pretest performance in the assigned goal condition was multiplied by the average goal difficulty level (the goal level selected divided by pretest performance) of subjects in the pilot study. In this way it was hypothesized that goal difficulty would be held constant between the participative and assigned goal setting conditions in the present study while taking into account each individual's ability and allowing for random assignment to conditions.

Subjects in both the participative and assigned goal conditions were asked to verbalize their goal to the experimenter, who then printed it on a 3×5 card and placed it on the workbench. Those in the do-best condition were simply instructed to do their best to assemble as many toys as possible in the 20-minute work period.

It should be noted that a deliberate strategy of general supportiveness was demonstrated by the experimenter in all experimental conditions. This was done to control for possible differential effects on performance due to supportiveness (Latham & Saari, 1979b). The strategy was characterized by: (a) shaking hands and giving subjects a friendly welcome; (b) asking rather than telling them to do things; (c) encouraging them to ask questions; and (d) acting pleasant and cheerful (e.g., smiling).

Measures

Data were collected on three major classes of variables: (1) manipulation checks, (b) goal acceptance, and (c) task performance. The manipulation checks consisted of questionnaire items administered at the end of the work session. To assess the effectiveness of the goal difficulty equating procedure on subjects' perceptions of goal difficulty, each was asked to respond to the following question on a 5-point Likert type scale: "How difficult was it for you to attain the goal?"

Participation (perceived influence) in setting the goal was measured by the following three questions, also rated on a 5-point scale: "Regardless of other interactions with your supervisor, how much influence did you have over the goal that was set?" "Compared to the supervisor, how much influence did you have over the goal that was set?" "Regardless of other interactions with your supervisor, how much say did you have in determining the goal?" Similarly, using a 5-point scale, participation in decisions concerning task strategy was assessed by the following three questions: "Forgetting the goal setting process, how much input do you feel you had with regard to making decisions about the task?" "Compared to your supervisor, how much influence did you have with regard to making decisions about the task?" "Regardless of other interactions with your supervisor, how much say did you have in decisions about your job?"

Efforts at controlling job understanding and cognitive elements of PDM were assessed by the following six questions: "To what degree do you feel that you understood the instructions for the task you worked on?" "How well did you understand your particular role in this exercise?" "To what extent did you grasp or comprehend how to go about doing the task?" "How clear were the performance expectations to you on this task?" To what degree did you know what you were accountable for on this task?" "To what extent were your responsibilities on this task clear to you?" All questions employed a 5-point scale.

The assessment of supervisory supportiveness required each subject to rate the experimenter on the following 12 bipolar adjectives, each with a 7-point scale: pleasant/unpleasant, cold/warm, supportive/nonsupportive, considerate/inconsiderate, accepting/rejecting, nasty/nice, friendly/unfriendly, gloomy/cheerful, quarrelsome/harmonious, kind/unkind, not understanding/understanding, and helpful/unhelpful.

Goal acceptance was measured by four questions, each responded to on a 5-point scale: "Commitment to a goal means acceptance of it as your own personal goal and your determination to attain it. How committed were you to attaining the goal that was set?" "How important was it to you to at least attain the goal that was set?" "To what extent did you strive to attain the goal that was set?" "How reasonable was the goal that was set to you?"

Performance was operationalized by measuring the number of staples each person used during the 20-minute work period. Although the goal for each subject was in terms of the number of toys assembled, the number of staples used was a more precise measure of work accomplished for statistical analysis. For example, an individual could join two parts of a toy with two staples and the toy would appear half assembled. However, because only two staples were used out of a total of eight required for a completed toy, the person actually was only one quarter of the way done with the assembly. Thus the number of staples used provided a measure of both quality and quantity of performance.

Data Analytic Procedures

An analysis of variance was used to assess the effectiveness of the manipulation checks and the measure of goal acceptance. Performance was analyzed using analysis of covariance. Each person's pretest performance was used as a control for ability. In addition, four planned comparisons of performance were conducted among the following conditions: (1) participative goal setting versus assigned goal setting, (2) assigned goal setting versus "do best," (3) participative plus assigned goal setting versus "do best," and (4) participative decision making versus assigned decisions in the "do-best" group. Finally, a Pearson *r* was computed to determine if there was a linear relationship between goal difficulty and performance.

Results

A summary of the dependent variable means and standard deviations for each cell of the experimental design is shown in Table 1.

Goal Difficulty

A 2 × 2 analysis of variance with the method of setting goals and PDM as the independent variables revealed no significant main or interaction affects. Thus, the manipulation designed to equate goal levels between the participative and assigned goal setting groups was effective.

Participation

The goal influence index was the mean of the three questionnaire items on perceived goal influence (Cronbach's alpha = .96). A 2 × 2 analysis of variance revealed that individuals in the participative goal setting condition perceived far more influence in setting their goals than did individuals in the assigned goal condition [$M = 4.15$, $SD = .82$, and $M = 1.35$, $SD = .73$, respectively; $F(1,44) = 149.3$, $p < .01$]. There were no other significant main or interaction effects.

The index measuring perceived influence on task strategy decision was the mean of the three questionnaire items on this topic (Cronbach's alpha = .96). The mean influence level of those individuals who participated in decisions on task strategy was 4.45 ($SD = .52$) compared to 1.39 ($SD = .62$) for those individuals who were simply assigned task alternatives. This difference was significant [$F(1,66) = 509.16$, $p < .01$]. No other main or interaction effects were obtained.

Job Understanding

The mean of the six questions assessing job understanding (Cronbach's alpha = .75) was 4.01 ($SD = .63$). There were no main or interaction effects between conditions as assessed by a 2 × 3 analysis of variance. Thus, the efforts to control the amount of information provided in each experimental condition were successful, and all subjects understood to a high degree the task and their responsibilities.

Supervisory Support

There were no significant differences among conditions on the 12-item measure of perceived supervisory support (Cronbach's alpha = .92). All of the subjects indicated that a relatively high level of supportiveness was present on the part of the experimenter ($M = 5.93$, $SD = .76$).

Goal Acceptance

The measure of goal acceptance was the mean of the four questionnaire items assessing this variable (Cronbach's alpha = .81). A 2×2 analysis of variance revealed no significant main or interaction effects among the conditions. The overall mean was 3.89 on a 5-point scale ($SD = .69$), indicating that goal acceptance was relatively high in all conditions.

Table 1
Summary of Dependent Variable Cell Means and SDs

	Participative Goal Group		*Assigned Goal Group*		*Do Best Group*	
Dependent Variables	$\bar{x}$	*SD*	$\bar{x}$	*SD*	$\bar{x}$	*SD*
Participative Decision Making Group						
Objective goal level	311.30	53.70	302.00	36.10	—	—
Perceived goal difficulty	3.00	1.34	2.25	1.29	—	—
Influence (task strategy)	4.36	.52	4.50	.56	4.50	.52
Influence (goal setting)	4.17	.64	1.39	.60	—	—
Job understanding	3.99	.63	4.19	.68	4.17	.47
Supervisory support	6.02	.73	6.00	.83	6.19	.68
Goal acceptance	3.92	.54	4.08	.57	—	—
Performance[a]	323.1	57.5	311.6	44.6	284.8	57.9
Assigned Decision Group						
Objective goal level	321.30	47.90	315.30	55.80	—	—
Perceived goal difficulty	2.58	1.31	2.75	.97	—	—
Influence (task strategy)	1.61	.85	1.17	.41	1.39	.49
Influence (goal setting)	4.14	1.00	1.31	.87	—	—
Job understanding	3.97	.60	4.17	.72	3.58	.56
Supervisory support	5.72	.91	5.95	.83	5.68	.56
Goal acceptance	3.63	.54	3.92	.99	—	—
Performance[a]	336.8	45.6	322.5	55.2	290.9	65.5

[a] See Table 3 for performance means adjusted for the ability covariate.

Performance

A test for homogeneity of regression coefficients, which is a fundamental assumption of analysis of covariance (Winer, 1962), revealed no significant difference among the experimental conditions. Thus, a 3×2 analysis of covariance was conducted using the performance premeasure (ability) as the covariate. The analysis revealed a significant main effect for goal setting [$F(2,65) = 5.07$, $p < .01$] but no effects for participative decision making or for the interaction of participative decision making and goal setting (see Table 2). The adjusted mean performance levels for the experimental conditions are presented in Table 3.

Table 2
ANCOVA Summary Table for Task Performance

Source of Variation	df	MS	F	Significance
Covariate (ability)	1	110188.95	74.34	.001
A) Goal condition	2	7520.04	5.07	.001
B) Decision condition	1	471.07	.32	.575
AB) Interaction	2	614.42	.42	.662
Error	65	1482.20		
Total	71	3144.27		

Certain a priori comparisons were of particular interest in the design of this experiment, and four planned *F*-tests were conducted (Winer, 1962). No significant difference was found between participative goal setting and assigned goal setting. Nor was there a significant difference between the participative decision making group and the assigned decision group in the do best condition. There was a significant difference, however, between the assigned goal condition and the do best condition [$F(1,65)=4.95, p<.05$] and between the combination of the participative and assigned goal setting conditions and the do best control condition [$F(1,65)=6.03, p<.05$].

Table 3
Adjusted Performance Means for Experimental Conditions

	Participative Goal Setting	Assigned Goal Setting	Do Best	Overall
Participative decision making	325.4	318.5	283.1	309.0
Assigned decisions	324.4	318.0	300.0	314.1
Overall	325.0	318.3	291.5	

There was a significant linear relationship overall between the actual goal that was set and the number of toys assembled during the task, $r(46)=.70$, $p<.01$. With ability partialed out, $r=.31$, $p<.02$.

Discussion

Of the eleven studies in a series of investigations examining the effects of participation in goal setting on performance, 4 studies, including the present one, were conducted in the laboratory; 7 studies were conducted in the field. The samples have included loggers, typists, engineers/scientists, government workers, and college students. The tasks have included felling trees, typing, test scores in a selection battery, performance appraisals, brainstorming, basic arithmetic, and performing in a business game.

The experimental design used in the present study was an improvement over previous investigations in that both PDM in task strategy and in goal setting were manipulated independently. Yet, the conclusions are the same. The motivational effect of participation in itself does not affect performance.

Participation affects performance only to the extent that it affects goal difficulty (Latham et al., 1978). If assigned goals lead to higher goals than do those that are set participatively, then performance also is higher with assigned goals (Latham et al., 1982). In the present study there was a positive linear relationship between an objective measure of goal difficulty and performance.

With regard to external validity, the results of this one study must be viewed in conjunction with those studies that have immediately preceded it. Further, Dipboye and Flanagan (1979) have noted: "There are differences among organizational settings that are as large as the differences that exist between an organizational setting and a laboratory." Because of this, the coordinated use of both the laboratory and the field provides a more powerful research vehicle for testing hypotheses than does the use of either in isolation (Runkel & McGrath, 1972). The variety of actors, settings, and tasks described in the 10 preceding studies provides strong support for the conclusions drawn here.

When viewed as a whole, this series of studies provides strong support for Locke's (Locke, 1968; Locke, Shaw, Saari, & Latham, 1981) theory of goal setting: namely, specific goals lead to higher performance than do generalized "do best" goals; there is a linear relationship between goal difficulty and performance; and participation in task strategy, from a motivational standpoint, affects performance only to the extent that it includes the setting of a specific goal and/or a specific goal that is more difficult than the one that is assigned unilaterally by a supervisor.

The results of these 11 studies may run counter to the prevailing ideology of many behavioral scientists, but they do not run counter to the empirical evidence. As Locke and Schweiger (1979) pointed out, the issue of participative decision making should be regarded as a pragmatic rather than a moral one. Too frequently a false dichotomy is presented to management: an authoritative approach or a participative one. As implied in this and the previous studies in the series, goal setting, supportiveness, or job understanding are not precluded by an authoritative style of leadership, one that does not emphasize participative decision making. It would appear that these conclusions will not be viewed as particularly new or controversial by many European or Latin American readers. In the *Annual Review of Psychology*, Faucheux, Amado, and Laurent (1982) report that: (a) the industrial democracy movement in Scandinavia has lost much of its initial thrust of the 1960s; (b) the assumptions of Theory Y are contradictory to the social reality of Latin America as well as the Catholic work ethic in Latin Europe; and (c) in many areas of France and Italy the human relations movement is viewed as naive.

Nevertheless, the present study examined only the motivational mechanism by which PDM has been hypothesized to affect performance. The second major mechanism by which PDM, according to the literature (Bartlem & Locke, 1981), affects performance is cognitive in nature. The cognitive effects of PDM, as Bartlem and Locke have pointed out, can be determined by comparing decision quality with and without PDM under varying conditions of subordinate knowledge. This was not done in the present study. In one previous study, when subordinate knowledge was held constant, participation in goal setting had no effect on decision quality (Latham & Saari, 1979a). This is understandable in that the participation was restricted to a decision on a specific quantity rather than quality of ideas to be produced. In another previous study (Latham & Saari, 1979b), a post hoc interview with the experimenter who was blind to the hypotheses of the study revealed that participation in goal setting resulted in greater understanding of task requirements than that which occurred when goals were assigned to subjects. Clearly, studies are needed that examine the cognitive effects of participation on performance independently of the goals that are set. One vehicle for doing this is to employ the Vroom-Yetton (1973) model, whose current validity is limited at the present time to self-report data (Field, 1979). The motivational effects of participation on performance, however, appear to be minimal.

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Cusp Catastrophe Model of Employee Turnover[1]

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A cusp catastrophe model is developed to explain job turnover of nursing employees. The temporal dynamics of the catastrophe model suggest that leavers experience lower organization commitment than do stayers prior to termination. Leavers' perceptions of job tension and commitment appear to cross the threshold levels prior to the termination dates.

Although it is recognized that job terminations occur for various reasons, there has evolved a consistent line of research evidence indicating that voluntary job terminations can be explained from the employee's intentions to leave an organization (Bluedorn, 1982). March and Simon (1958) suggested that this intentional decision involves a subjective evaluation of the employee's job aspirations in comparison with the expected value of job opportunities in the present organization and the availability of attractive opportunities in other organizations or alternative careers. The employee's decision to quit is not considered an impulsive action but one that is rationalized over time (Simon, 1957).

Mobley (1977) and Mobley, Horner, and Hollingsworth (1978) have suggested that the termination decision process can be described as a sequence of cognitive stages starting with an initial dissatisfaction with the present job, followed by an intention to search for a different job, an active search and evaluation of alternatives, then an expressed intention to quit, and finally job termination. Each successive step represents increasing withdrawal from the organization. Research has found that measures of the employee's behavior intentions at earlier cognitive stages are significantly related to measures at subsequent stages of withdrawal. Furthermore, the cumulative step-by-step measures have explained significant portions of variance in the final termination decisions (Miller, Katerberg, & Hulin, 1979; Mobley et al., 1978). Nevertheless, in a comprehensive review of the turnover literature, Mobley, Griffeth, Hand, and Meglino (1979) concluded that there

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still is a great deal more to be learned about the decision processes leading to job termination.

The hypothesis of a dynamic decision process occurring over time highlights three limitations in previous studies of job terminations. First, the research generally has utilized cross-sectional designs in which measures of different withdrawal stages are obtained from an employee survey at a given point in time. These measures then are used to predict subsequent job terminations usually within a 12-month period following the questionnaire survey. The cross-sectional model assumes that the respondents simultaneously occupy all stages of withdrawal to varying degrees. The findings indicate significant relationships among concurrent measures of different cognitive states. However, the cross-sectional design does not explain adequately how or why the employee moves through successive stages of withdrawal or when those transitions occur.

A second limitation of the cross-sectional design is the varying time intervals between the questionnaire survey and the actual termination dates. Job terminations are recorded continuously during the measurement period but are aggregated over a specified time period for analytical purposes. At the time of the survey some respondents already may have completed their search and evaluation of other job alternatives. Consequently, their termination date may be only days or weeks away. Other respondents may have become dissatisfied with their jobs and are just beginning to think about alternatives. These respondents may continue an active search of job alternatives and eventually terminate employment several months in the future. Other employees may be satisfied with their jobs at the time of the survey and have little propensity to terminate employment. These respondents may stay during the measurement period, or they may eventually quit their jobs as a result of later withdrawal decisions that would not be reflected in the questionnaire measures. Depending on the employee's cognitive stage at the time of the survey, the measured variables are likely to have varying relationships with subsequent job terminations. The different time intervals between survey measures and the termination dates for various respondents are likely to confound the strength of the predictive relationships estimated from cross-sectional models.

A third limitation is that previous studies generally have assumed continuous and linear relationships between the different decision stages and the variables influencing the employee's withdrawal. Guastello (1981), however, argued that withdrawal from an organization may represent discontinuous changes in behavior that can appear as different outcomes, such as declining productivity, absenteeism, strikes, or job terminations. In this perspective, job termination represents a qualitatively different behavioral state than does employee retention and may not be associated with large changes in the variables influencing withdrawal. Instead, the presumed causes of withdrawal may have been changing slowly and smoothly until some threshold is reached that results in an abrupt change from job retention to termination.

The purpose of this study is to extend the research on the withdrawal processes leading to job termination. The objectives are to examine how survey measures explain the transition from retention to termination states of behavior and to obtain a better understanding of the process by which the transition occurs. A dynamic process model is examined in order to circumvent some of the shortcomings associated with the use of linear cross-sectional models of employee turnover.

Mobley et al. (1979) suggest that two factors are related to the employee's progression through successive stages of withdrawal. One factor reflects the employee's evaluation of the organization's future expected value with respect to his or her work aspirations. Termination may represent the employee's decision to accept a more attractive job opportunity. The second factor focuses on the tension associated with the employee's present work conditions. Termination may represent the employee's decision to leave a stressful work environment.

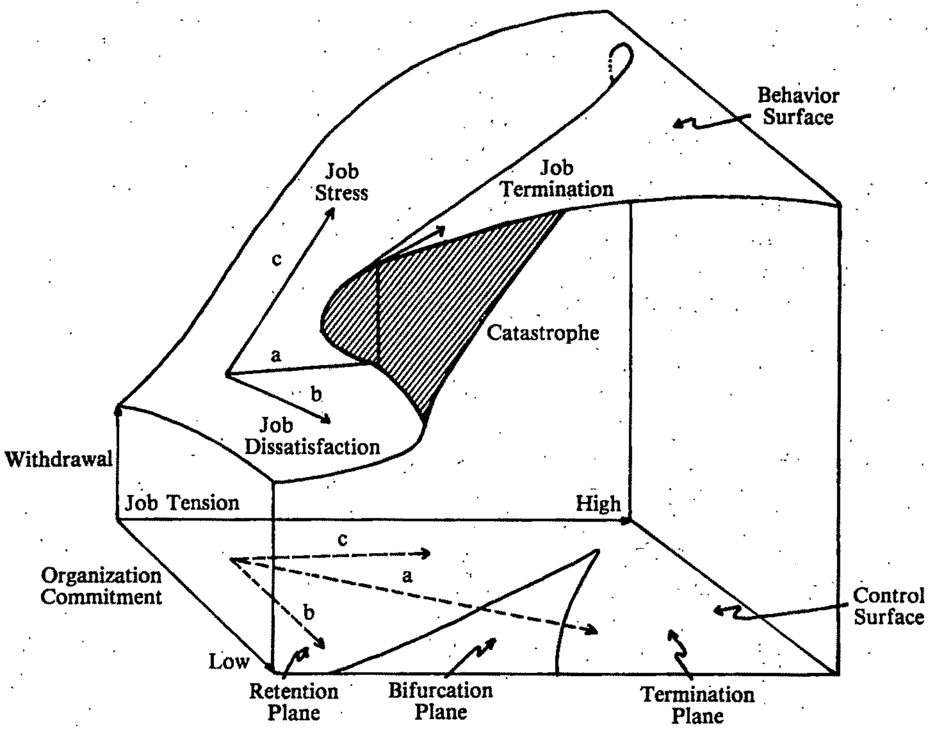
Previous research (Alutto, Hrebiniak, & Alonso, 1973; Becker, 1960; Hrebiniak & Alutto, 1972; Kraut, 1975; Stevens, Beyer, & Trice, 1978) has operationalized the employee's expected value perceptions as a measure of exchange commitment to the organization. High exchange commitment implies that the employee has made an implicit comparison of expected job benefits with alternative job opportunities and is satisfied that the present job offers benefits that are as attractive as any other alternative. Commitment is measured as the employee's behavior intention to continue working for the organization in lieu of accepting an alternative job that may offer potentially better socioeconomic benefits.

Job tension indicates the number and frequency of different stressors present at work (Brief, Schuler, & Van Sell, 1981). Job tension measures work conditions that create stress for the employee as a result of role ambiguity or conflict within the organization; interrole conflict with competing family, social, or professional role responsibilities; and other stressful events such as work overload and inadequate resources or skills to perform the job as expected (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964). Increasing levels of tension in the current job may lead to a decision to quit in order to avoid the stressful work environment (Lofquist & Dawis, 1969).

Catastrophe theory (Thom, 1975; Zeeman, 1976) provides a useful phenomenological model for examining a dynamic withdrawal process that occurs over time and is posited to result in a discontinuous transition from retention to termination. The cusp catastrophe model, illustrated in Figure 1, was selected for analysis in this study because it represents the most complete description of a one dimensional behavior space of withdrawal having a two dimensional control space of commitment and tension (Fararo, 1978).

The cusp catastrophe model has three characteristics (Flay, 1978). First, the withdrawal behavior can be considered a discontinuous variable with abrupt changes being observed between one state of withdrawal and another. The change in withdrawal is characterized by a delay rule such that the

Figure 1
Cusp Catastrophe Model of Employee Turnover



employee's behavior will tend to vary continuously in one state as long as possible (Sussmann & Zahler, 1978). The cusp catastrophe model thus describes the transition from retention to termination as a phenomenon in which the employee attempts to retain employment in the organization as long as possible.

Increased withdrawal of retained employees would be manifested in job dissatisfaction as a result of declining exchange commitment, or work stress as a result of increasing job tension, or some combination of outcomes representing both dissatisfaction and stress. When a continuous decrease in commitment and/or increase in job tension for a retained employee is no longer possible, the employee will move abruptly to a termination state of behavior. The "a" path in Figure 1 illustrates one possible transition from retention to termination states of behavior. The trace of this time path is projected on the control surface.

The cusp behavioral surface describes a dense set of time paths that represent the population of individual movements through withdrawal. Each employee follows a particular path over time. Some leavers may move from job dissatisfaction to termination; other leavers may move from stress to termination; and yet others may move through different combinations of stress and dissatisfaction to termination.

The second characteristic of the cusp model is the presence of a hysteresis zone of behavior for some values of the control factors. This zone is represented by the fold in the behavior surface. The trace of this fold is projected as the bifurcation plane on the control surface. There should be few employees with perceived levels of job tension and commitment falling in the bifurcation plane, because this region represents a state of disequilibrium in which the employee is about to change from retention to termination states of withdrawal. Guastello (1981) suggested that in the short run employees may demonstrate high absenteeism while in this hysteresis zone.

However, not all time paths cross the bifurcation plane. This possibility is illustrated in Figure 1 by the projections of the "b" and "c" paths on the control surface. As an employee moves along the "b" path, it is possible to experience diminishing commitment to the organization but yet perceive little job tension. This path may result in job dissatisfaction because of a perceived deficiency in the benefits received in exchange for organization membership. However, if the employee perceives little stress from the work environment, the path will not cross the bifurcation plane and job termination is unlikely. As an employee moves along the "c" path, there are increasing levels of job tension. This time path would result in a stressful work experience, but the employee may not terminate employment if more attractive job alternatives are not available. Because the individual perceives a high exchange commitment to the organization vis-à-vis other job opportunities, this path does not cross the bifurcation plane, and job termination is unlikely.

A third characteristic is the divergence of behavior that occurs on opposite sides of the bifurcation plane. As an employee approaches the fold region, even small changes in the control variables can result in discontinuous changes from retention to termination. Two employees on opposite sides of the bifurcation plane would demonstrate quite different withdrawal behavior (i.e., one stay and one leave) even though there may be small differences between them in the measured values of the control variables. Yet two other employees on the same side of the bifurcation plane would demonstrate the same withdrawal behavior (i.e., both stay or both leave) even though there may be large differences between them in the measured control variables.

The cusp catastrophe model provides several propositions for explaining how job tension and commitment affect the transition from retention to termination states of behavior. First, the model suggests that withdrawal, to the point of termination, is not a continuous linear function of either tension or commitment. Instead, terminations are posited to represent a discontinuous change in withdrawal behavior occurring only after the bifurcation levels of tension and commitment are exceeded. The relative distribution of retention and termination observations on the control surface can thus be posited as:

> *H1. The plot of the withdrawal observations on the control surface will indicate a bifurcation plane separating two different areas of retention and termination behaviors.*

This hypothesis examines the equilibrium state of the behavior surface at a point in time (Cobb, 1981; Jiobu & Lundgren, 1978). The underlying assumption is that the observed terminations resulted from individual movements on various behavior paths that crossed the bifurcation plane during some earlier time period.

The dynamic propositions describe these temporal changes in job tension and commitment that affect the transition from one behavior state to another (Cobb, 1981). In the present study it was not possible to examine the transitions through all stages of withdrawal because the behavior variable was simply a nominal measure of retention or termination. Moreover, the measures of the control variables could be obtained only when the employee was in the retention state of behavior. It was not feasible to have terminated employees report their job tension and commitment after they had already terminated employment. Therefore, the dynamic hypotheses were limited to graphical propositions (Oliva, Peters, & Murthy, 1981; Zeeman, Hall, Harrison, Marriage, & Shapland, 1976) describing the changes in the control variables occurring prior to the termination dates.

Two dynamic hypotheses are suggested by the model. First, the catastrophe analog simulator developed by Zeeman (1976) indicates that the behavior surface reaches a local minimum or maximum point prior to the discontinuous shift in the behavior surface. Therefore, it was posited that an inflection point would occur in the leaver's control variables as the actual termination date approaches. The posited inflection in the leaver's measures, vis-à-vis stayer's scores, can be graphically examined as:

H2. Sharply declining commitment and/or increasing tension for leavers will result in larger differences between the stayers' and the leavers' control variable measures for those employees nearer to the actual termination dates.

A third proposition is that the employee's perceptions of job tension and commitment move across the bifurcation plane in order for terminations to occur. The temporal changes in the leaver's control variable measures are graphically examined as:

H3. Changes in repeated measures of the leaver's job tension and commitment would cross the bifurcation plane prior to the termination date.

Method

Data Collection

The hypotheses were examined in three independent studies. Hypothesis 1 was tested using a sample of nursing employees in three hospitals. Previous research (Bognanno, Hixson, & Jeffers, 1974; Sloan, 1975) has indicated that nurses' propensity to terminate employment voluntarily decreases with longer job seniority. Over 80 percent of the job terminations in the participating hospitals occurred among nurses with five or less years' seniority in the hospital. Therefore, to analyze withdrawal behavior during this period of active turnover, only those nurses who had been hired within the previous five years were included in the sample. A total of 346 respondents completed the questionnaire measures of the two control variables. Of these nurses, 49 voluntarily terminated employment within 12 months of the questionnaire survey, for a sample turnover rate of 14 percent.

The test of the two dynamic hypotheses involved two separate studies. The analysis of Hypothesis 2 involved a quasi-longitudinal design to examine whether the differences between the stayer's and leaver's control variable measures would be larger for those employees nearer the termination dates. This study involved 294 nurses who had been working at a fourth hospital for less than five years. Of these employees, 43 voluntarily terminated employment during a 15-month period following the questionnaire survey, for a sample turnover rate of 17 percent.

To control for exogenous effects on the measured control variables, the 43 leavers were matched with stayers on 7 demographic and job characteristics that have been associated with termination decisions as well as perceptions of job tension and commitment (Bognanno et al., 1974; Hrebiniak & Alutto, 1972; Kahn et al., 1964; Sloan, 1975; Stevens et al., 1978). Each leaver was matched with a stayer who was of the same sex, worked on the same shift, and had the same marital status, family status (did or did not have preschool children at home), education (RN or LPN), age (born within 18 months of each other), and hospital seniority (hired within 12 months of each other). Inability to match leavers with stayers on all seven demographic and job characteristics resulted in a further reduction in the sample size to 34 leavers and 34 matched stayers. There were proportionately fewer respondents who worked on the evening and night shifts. Consequently, in a few instances leavers on the evening shift were matched with stayers on the night shift and vice versa. Day shift stayers, however, were matched only with day shift leavers. Because of sample limitations, 10 leavers in the final sample were matched on all parameters with the exception of family status.

The leaver's termination dates occurred at the following time intervals after they had completed the survey measures: 8 terminations within the first 3 months, 6 terminations between 4 and 6 months, 6 terminations between 7 and 9 months, 5 terminations between 10 and 12 months, and 9 terminations between 13 and 15 months. A graphical analysis was made of the differences in the average control variable scores between leavers and the matched stayers in each 3-month cohort over the 15-month measurement period.

The quasi-longitudinal analysis of Hypothesis 2 examined between-subject changes in the control variables at different time intervals before the termination dates. This graphical analysis may be used to identify inflection points in the control variables prior to the termination dates, but it does not test within-subject changes in the control variables over time. Therefore, Hypothesis 3 was examined through a longitudinal panel design to analyze whether repeated measures of the leaver's control variables moved across the bifurcation plane during a time period immediately preceding the termination dates. Porter, Crampon, and Smith (1976) and Sheridan and Kerr (1980) indicated that changes in job tension and commitment were most likely to occur during the six months preceding job termination. A 6-month period therefore was selected for the longitudinal study. A total of 165 nursing employees in five different nursing homes completed two repeated measures of the control variables at a 2-month interval. Of these respondents, 19 terminated employment during the 4 months following the second measurement, for a turnover rate of approximately 12 percent in this sample.

Measures

The questionnaire surveys were conducted directly by the researchers during work hours. To delineate a bifurcation plane on the control surface accurately and to measure changes in individual scores relative to the bifurcation plane, it was important that the survey measures approximate an equal interval scale. Fararo (1978), however, indicated that inferences from the catastrophe model are invariant under any monotonic transformation of the control variable scales. Consequently, the response anchors for both the tension and commitment variables were described as five equal proportion intervals comprising the range from 0 to 100 percent.

The commitment instrument included scale items proposed by Alutto et al. (1973). The 5-item commitment scale measured the likelihood (percentage probability) that the nurse would accept another nursing position if offered a hypothetical job in a different organization that provided an increase in pay, more freedom to be creative, more status, work with people who are more friendly, and work for a supervisor who is more supportive. The commitment score was computed as the average subjective likelihood of accepting a job that offered each of these five benefits. High commitment scores indicate a behavior intention that the nurse would likely continue her present job in lieu of accepting the potentially more attractive alternative. The internal reliability of the commitment measure was Cronbach's alpha = .89, .87, and .92 in the three studies.

The job tension instrument included scale items proposed by Kahn et al. (1964), which measured the frequency (percentage of time) that the nurse was bothered by various work stressors such as role ambiguity and conflict, work overload, and inadequate resources. The tension score was computed as the average frequency of 15 stressful work items. The internal reliability of the tension measure was alpha = .71, .85, and .86 in the three studies. The correlation coefficient between job tension and commitment was $r = -.29$, $-.24$, and $-.36$ in the three studies.

Job terminations were recorded from hospital or nursing home records and included only those employees who voluntarily quit their jobs. Dismissals, retirements, or medical leaves of absence were not considered as voluntary terminations.

Results

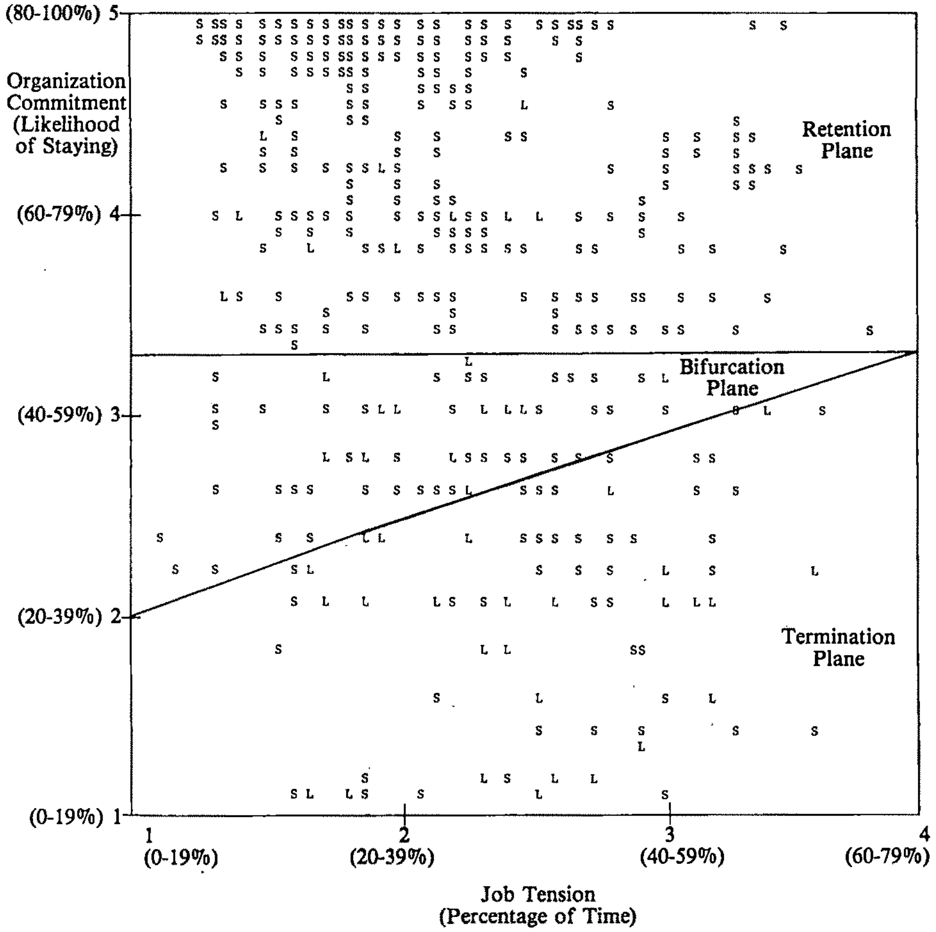
Hypothesis 1 was analyzed following a qualitative methodology proposed by Jiobu and Lundgren (1978) for fitting a bifurcation plane on the control surface. They suggested two inductive criteria for graphically identifying the boundary of a bifurcation plane. These criteria were: (1) that no more than 30 percent of the total observations should fall within the bifurcation plane and (2) that no more than 25 percent of any particular behavior observation should cluster in a particular area of the bifurcation plane.

Although these criteria are nominal guidelines for delineating a bifurcation plane, the important distinction is the relative density of behavior observations found in different regions of the control plane. The bifurcation plane is a low density hysteresis region falling between two high density areas of expected behavior observations. In each of these two areas frequent observations of either retention or termination behavior are predicted to occur. The distance between individual control variable measures is less important in explaining the employee's retention or termination than knowing whether the measures for a particular individual are above or below the bifurcation plane. Moreover, the criteria do not imply simply an interaction effect between the two control variables. Two individuals on opposite sides of the bifurcation plane may be close or far apart in their control variable measures and still be expected to demonstrate different withdrawal behavior (i.e., one stay and one leave). Yet, two other individuals on the same side of the bifurcation plane may be close or far apart in their measures and still be expected to demonstrate the same behavior (i.e., both stay or both leave).

Figure 2 illustrates the plot of the retention and termination observations on the control surface for the sample of nursing employees in the three hospitals. In a few instances the stayers' (S) data points are located at approximate positions when several observations were recorded at the same axis of tension and commitment.

The bifurcation plane was a low density region containing only 16 percent of the total observations (54 nurses). The bifurcation plane represents a hysteresis region in which proportionately both termination and retention behaviors were probable. The turnover rate among nurses located in the bifurcation plane was 22 percent, compared to the total sample turnover rate of 14 percent. The retention plane encompassed a high density region in which job terminations were highly improbable. Sixty-five percent (226 nurses) fell in the retention plane with the turnover rate among these nurses being only 4 percent. The termination plane encompassed a region in which job terminations were highly probable. The termination plane had relatively low density, with only 19 percent of the employees (66 nurses) located within this area. The density was lower than expected but may be accounted for by the relatively small proportion of terminations observed in the data sample. However, the turnover rate among nurses in the termination plane was 41 percent and was significantly higher ($p < .01$) than the turnover rate found in the retention plane.

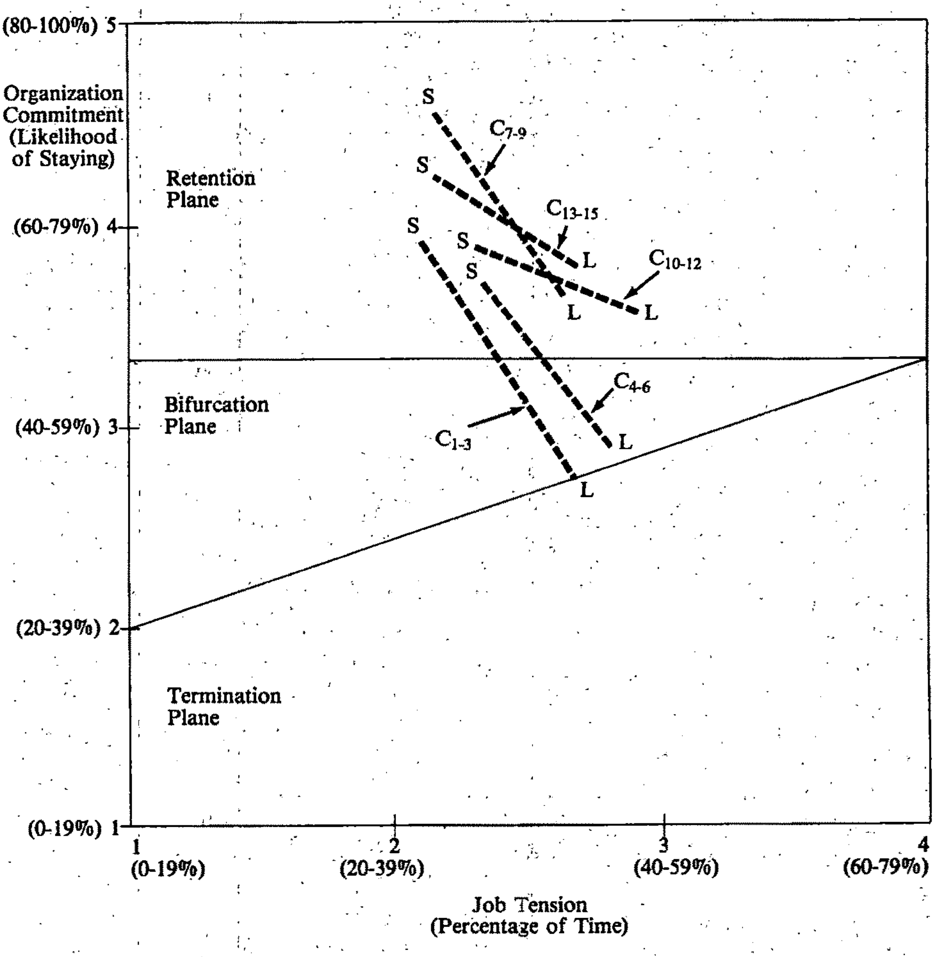
Figure 2
Control Surface for Cusp Model of Nursing Terminations
[$N=49$ Leavers (L) and 297 Stayers (S)]



From the binomial distribution, when the total sample termination rate was 14 percent, the probability of finding 27 leavers out of 66 individuals in the termination plane is highly significant ($p \leq .01$). Also, from the binomial distribution, the probability of finding only 10 leavers out of 226 individuals in the retention plane is highly significant ($p \leq .01$). Therefore, it is unlikely that the disproportionate dispersion of leavers between the termination and retention planes could represent a chance occurrence.

The graphical analyses of Hypothesis 2 is illustrated in Figure 3, which indicates the location of the mean job tension and commitment scores for leavers and matched stayers in different time cohorts before the termination dates. The boundary of the bifurcation plane, determined from Figure 2, has been superimposed on the plot of the mean scores for each cohort group. In all five time cohorts the mean control variable scores for stayers

Figure 3
Mean Control Variable Scores for Leavers (L) and Matched Stayers (S) at Different Time Cohorts (C_t) Before Actual Termination Dates



were located in the retention plane. Leavers reported higher job tension and lower commitment scores than did stayers in each cohort group, with large differences (paired t-test, $p \leq .10$) in commitment found in the three cohort groups 1 to 3, 4 to 6, and 7 to 9 months prior to job termination. The mean control variable scores fell on opposite sides of the bifurcation plane for the stayers and leavers in the two cohort groups nearest the termination dates.

The leavers' commitment scores in these latter two groups were markedly lower than the average scores reported in three earlier cohort groups, 7 to 9, 10 to 12, and 13 to 15 months before termination. In these earlier cohort groups, the mean scores for both stayers and leavers were located in the retention plane. The evidence of larger differences between stayers' and leavers' commitment scores in the latter cohort groups, accompanied by markedly lower commitment scores for the leavers in these latter cohorts, indicates support for Hypothesis 2 with respect to the commitment control variable but not job tension.

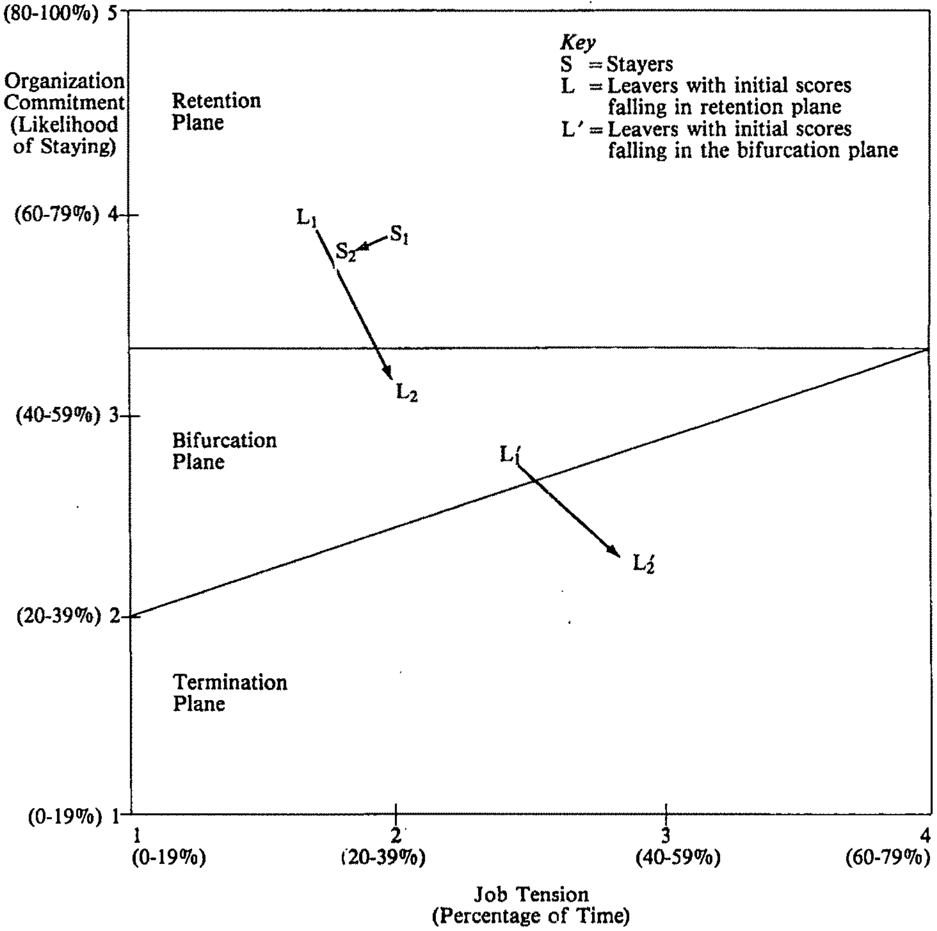
The pattern of lower commitment measures for leavers in the latter cohorts tends to corroborate the findings of Porter et al. (1976), who conducted a longitudinal study of newly hired management trainees during their initial 15 months in an organization. Matching leavers with stayers who had the same time in the training program, they found that leavers demonstrated a markedly lower commitment to the organization vis-à-vis stayers during the six months preceding their termination dates. Porter et al. concluded that "the important point seems to be that when a marked decline in commitment starts to occur it is likely, though obviously not invariably, signaling a voluntary termination in the near future" (1976, p. 96).

Nevertheless, the interpretation of both the Porter et al. (1976) study and the present research findings are somewhat tenuous because the results may be confounded by two limitations of the quasi-longitudinal design. First, the matching process served to control for exogenous influences on the control variables and turnover propensity within a particular leaver-stayer dyad. However, the values of the demographic and job characteristic variables for matched respondents varied somewhat between each cohort group. Consequently, the significance of the pattern of declining commitment found among the average group scores is confounded by the different types of individuals that may be found in different cohort groups.

Second, the matching process resulted in a severe constraint on the sample size in each cohort. From an original sample of 294 employees in the hospital, a maximum subsample of only 9 matched leaver-stayer dyads could be found within any particular 3-month cohort group. Likewise, the cohort samples in the Porter et al. (1976) study ranged from only 11 to 16 dyads. The statistical power of any comparative test between stayers and leavers with such small sample groups is exceedingly low (Schmidt, Hunter, & Urry, 1976).

The graphical analysis of Hypothesis 3 is shown in Figure 4. Figure 4 indicates the location of the mean scores for the repeated measures of the control variables obtained over a 2-month interval for the 19 leavers in the sample of nursing home employees. Initial scores that fell in the retention plane were reported by 13 leavers. Two months later all but four of these leavers reported control variable scores falling in the bifurcation plane. Figure 4 depicts the changes in the average scores for this group of leavers (L). The remaining six leavers reported initial scores falling in the bifurcation plane. Two months later all of these individuals reported control measures falling near the lower bifurcation boundary or in the termination plane. The changes for this group of leavers is depicted as (L′). For comparison purposes Figure 4 also illustrates the mean scores for the stayers in the nursing home sample. The stayers' mean scores changed little over the two month period and remained in the retention plane. An analysis of covariance

Figure 4
Changes in Mean Control Variable Scores for Leavers (L_t) and Stayers (S_t) over a Two Month Interval Immediately Preceding the Leavers' Termination Dates



indicated that the combined group of leavers reported significant changes ($p \leq .01$) in the control measures in comparison to stayers. The graphical and comparative analysis tends to support the third hypothesis, that the leaver's control variable measures would change across the bifurcation plane before the termination dates.

Discussion

The catastrophe model has several important implications for both predicting and describing the transition from employee retention to termination. From a prediction viewpoint the analysis of the static hypothesis indicates that withdrawal to the point of termination is not a continuous linear function of either job tension of commitment. Termination appears to represent a change in behavior that occurs frequently only after the bifurcation levels of job tension and commitment are exceeded.

The divergence between the retention and termination observations, displayed in Figure 2, would account for the relatively small portion of variance explained by linear models. Mobley et al.'s (1979) review of the turnover literature confirms that continuous linear models generally have had low predictive validity in explaining turnover data. Of the 85 linear bivariate relationships between survey measures and turnover data reported in Mobley et al., only 58 relationships (68 percent) were statistically significant. Moreover, these significant relationships explained an average of only 7.3 percent of the variance in turnover data. In addition, the 7 reported multivariate linear models, some having as many as 16 predictor variables, accounted for an average of only 21.2 percent of the variance in turnover data.

For comparative purposes the linear effects of each control variable and their interaction were examined in a regression model. The best fit model of the turnover data depicted in Figure 2 was computed to be:

$$\hat{T}=.66-.029OC-.013JT+.007(OC\times JT) \qquad (1)$$

where: $\hat{T}$ = predicted termination score (stayers = 0; leavers = 1)
OC = organization commitment
JT = job tension

This model explained an insignificant portion of variance in the observed turnover data ($R^2=.02$, $p\leq .25$). Table 1 summarizes the predictive accuracy of the linear model.

Table 1
Predictive Validity of Linear Regression Model

	Actual Observations	
Predictions	*Stayers*	*Leavers*
Stayers	True Positives	False Positives
$0<\hat{T}\leq .05$	5	0
$.05<\hat{T}\leq .10$	39	2
$.10<\hat{T}\leq .14$	86	15
Uncertain		
$.14<\hat{T}\leq .17$	123	18
Leavers	False Negatives	True Negatives
$.17<\hat{T}\leq .20$	22	10
$.20<\hat{T}\leq .25$	17	3
$.25<\hat{T}\leq .30$	5	1

With an 86 percent retention rate in the data sample, the distribution of predicted termination scores reported in Table 1 was skewed toward zero, with the median predicted value being ($\hat{T}=.14$). Based on the actual retention rate, only those individuals having predicted scores above the 86 percentile value ($\hat{T}\geq .17$) were considered to be predicted leavers. A total of 147 individuals with predicted scores below the median value were considered predicted stayers. Less certain predictions could be made for the 141 individuals with predicted scores falling between the median value and the 86 percentile. Excluding these uncertain predictions, 17 false positive predictions (9 percent) were made for individuals who were predicted to stay but actually quit. There were 44 false negative predictions (21 percent) made for individuals who were predicted to leave but actually stayed. Overall, the linear model predictions were 70 percent correct. The linear model, however, correctly predicted only 14 (28 percent) of the actual terminations.

Table 2
Predictive Validity of Cusp Catastrophe Model

	Actual Observations	
Predictions	*Stayers*	*Leavers*
Stayers in retention plane	True Positives 216	False Positives 10
Uncertain hysteresis effect in bifurcation plane	42	12
Leavers in termination plane	False Negatives 39	True Negatives 27

Table 2 summarizes the prediction errors from the cusp catastrophe model and suggests a higher predictive validity for the catastrophe model in comparison to the continuous linear model. Among the 292 behavior observations located in the retention and termination planes (depicted in Figure 2), 49 false predictions were made. This represents an overall predictive accuracy of 84 percent correct. Moreover, the catastrophe model correctly predicted twenty-seven (55 percent) of the actual terminations.

There were 10 false positive predictions made for nurses who terminated employment, even though they were located on the retention side of the bifurcation plane. This small percentage error (3 percent) could be anticipated because other researchers have estimated that as many as one out of four nursing terminations may be considered unavoidable from the organization's perspective. These terminations may be unrelated to the nurse's job tension or commitment and could be attributed to exogenous variables such as the nurse's family obligations (Brief, 1976; Seybolt, Pavett, & Walker, 1978).

A larger number (39) of false negative predictions were made for nurses who did not terminate employment even though they fell on the termination side of the bifurcation plane. This error group (13 percent) suggests that some nurses were psychologically ready to terminate employment but did not. It may be that, just as family obligations can contribute to unavoidable terminations, some nurses who might voluntarily terminate employment are constrained from making that decision because of financial and family responsibilities (Cleland, Bass, McHugh, & Montano, 1976; McCloskey, 1974). It would be useful for future research to perform a post hoc analysis of the demographic, financial, and family characteristics of employees who comprise the two error groups. A post hoc analysis of error observations would provide important information regarding the limitations of the catastrophe model to predict individual terminations.

The significance of the catastrophe model for predicting job terminations is that knowing the variation in control variable measures among different employees is less important in explaining job terminations than knowing whether the measures are located above or below the bifurcation plane. Two employees may have similar or varying perceptions of job tension and commitment. Yet, the prediction would be made that the two individuals would demonstrate the same or different withdrawal behaviors depending simply on whether their control variable scores were located on the same side or opposite sides of the bifurcation plane.

Perhaps even more important than the implications for predicting terminations is the potential advances that the catastrophe model offers in describing the withdrawal process leading to job terminations. Fararo (1978) and Postle (1980) emphasize that, unlike the linear models, catastrophe theory attempts not only to predict, but also to provide a descriptive analog of the underlying behavior phenomena. Although the methodology is highly qualitative, catastrophe theory represents an isomorphic model of how continuous causes can produce discontinuous and divergent effects.

The traditional focus on linear models has added to the understanding of the control variables that influence terminations. The present study attempts to demonstrate how two of these control variables, job tension and commitment, come together to produce a transition from retention to termination. From this perspective, linear and catastrophe models are not contradictory; they serve different purposes. Linear models serve to estimate the relative strengths of different variables in predicting terminations. The catastrophe model serves to explain the process of how continuous variation in the control variables over time affects a discontinuous transition from retention to termination.

The test of the dynamic hypotheses, H2 and H3, suggests that temporal changes in job tension and commitment are related to the employee's job termination. For those leavers nearest their termination dates, the magnitude of the leaver's commitment was markedly lower than that of the stayers. Moreover, the leaver's control variable measures appeared to change across the predetermined bifurcation plane during the months immediately preceding the termination date.

The findings of this study must be considered tentative, but the results indicate that the continuous variation in job tension and commitment beyond the bifurcation plane explains the discontinuous transition from retention to termination. There is a need, however, for a longer and more comprehensive longitudinal study to determine if and how employees move through different states of dissatisfaction and/or stress prior to termination and whether these behavior states occur at different areas on the tension/commitment control surface.

Catastrophe theory has been utilized to explain discontinuous phenomena in the social, behavioral, and biological sciences (Poston & Stewart, 1978) and may provide important extensions to turnover research. There are limitations to consider, however, when applying this mathematical analog to explain employee behavior. The underlying behavioral phenomena must correspond to the mathematical assumptions of structural stability and generalizability. Sussmann and Zahler (1978) discussed several important implications of these assumptions that relate to the study of employee turnover. First, the withdrawal phenomena must be assumed to be in a state of dynamic equilibrium such that the influence of the measured control variables on subsequent terminations remains stable over the study period. This assumption, of course, applies to catastrophe theory as well as to linear cross-sectional models, but it is difficult to verify in any particular study. The researcher does not know all the extraneous disturbances that may have occurred to an employee during the measurement period following the questionnaire survey. A change in job assignments or new co-workers may have altered job tension; or a salary increase or lack of salary adjustment may have altered commitment. If these disturbances occurred, they could have a stronger influence on the termination decision than the measures of job tension or commitment obtained several months before the termination date. Consequently, the assumed stability of the control variable effects may not be satisfied.

A second assumption of generalizability must be made when explaining individual withdrawal behavior as a function of the control variables. Withdrawal to the point of termination is an individual phenomenon, with each employee following a specific path in the model. All individuals are expected to maintain a retention state of behavior as long as possible. They move to termination behavior only when they cross the bifurcation levels on the control surface. It seems reasonable to generalize that a certain inertia exists in organizational membership that prevents employees from terminating employment after a stressful day or every time they hear of a potentially more attractive job. However, it is not certain whether all employees will follow the delay rule and attempt to retain employment as long as possible during the withdrawal process. Employees who find it easy to change jobs may quit at even the slightest feelings of job tension or an unsatisfactory benefit exchange. Others may find it difficult to terminate employment even if there is considerable dissatisfaction and/or stress associated with the present job. Consequently, individual differences need to be included more systematically in the catastrophe analyses of turnover in order to avoid a problem of "spurious functionalization" (Sussmann & Zahler, 1978). As noted earlier, individual differences in demographic, family, or financial variables may partially account for the prediction errors resulting from fitting a bifurcation plane among the total observations on the control surface.

Another question regarding catastrophe modeling of the withdrawal process is whether the behavior should be operationalized in terms of global or local properties (Sussmann & Zahler, 1978). Global properties relate to observable phenomena; local properties may not be observable. From a global perspective, termination can be operationalized as a discontinuous change in behavior: the employee is retained one day and terminated the next. Observations of these quit events can be analyzed on the control surface to determine whether the terminations fit a continuous or bifurcation function of the control variables. However, the quit event is only the last step in the withdrawal process, which has been described as a series of cognitive states, some of which may not be observable. Research has yet to determine whether these localized states are all influenced by the same control variables. Also, it is not known whether successive withdrawal states represent a continuous linear function of the control variable or whether the different stages represent discontinuous changes occurring only when bifurcation levels are reached in the control measures.

Moreover, Guastello (1981) has suggested that withdrawal may be manifested in other global behaviors such as declining productivity and absenteeism. He indicated that these behaviors result from the intersection of intrinsic and extrinsic control variables and that discontinuous changes in the withdrawal behaviors are likely to occur over an extended time period. Therefore, the potential application of catastrophe models in the analysis of employee withdrawal need not be limited to the relatively short run decision processes preceding job termination.

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A Longitudinal Study of the Effects of Boundary Spanning Supervision on Turnover and Promotion in Research and Development

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An investigation of the influence of boundary spanning project supervisors on the turnover and promotion of engineering professionals found that, in general, boundary spanning supervisors had little direct effect on the careers of all project subordinates. However, project supervisors who also were technical gatekeepers significantly affected the organizational careers of young engineers.

What factors influence turnover and promotion in research, development, and engineering (RD&E) settings? One research stream has looked at the effects of job experiences and formal supervision on turnover, performance, and promotion (Andrews & Farris, 1967; Berlew & Hall, 1966); others have looked at the norms and climate created in the laboratory (Barth & Vertinsky, 1975; Pelz & Andrews, 1966); and still others have looked at the effects of informal communication networks and boundary spanning roles (Allen, 1977; Katz & Tushman, 1981). In RD&E settings, boundary spanning individuals are key actors in the laboratory's communication and information processing activities (Tushman & Nadler, 1980). The present study focuses on formal and informal aspects of leadership by investigating (over a 5-year period) the influence of boundary spanning supervisors on the turnover and promotions of their project subordinates. Underlying the study is the basic idea that career decisions are strongly affected by how well individuals are linked into their organization's formal and informal networks (Graen & Ginsburgh, 1977; Organ & Greene, 1972).

Literature Review and Hypotheses

To keep informed about relevant external developments as well as new work requirements, project teams must gather information from a variety of outside sources. Such contact is especially critical for RD&E project teams, given their dependence on new technological advances within the larger professional community as well as their need to coordinate with other organizational areas (Roberts & Fusfeld, 1982; Utterback, 1974).

Although RD&E groups must acquire outside information, considerable research has shown that widespread direct contact by all engineering project members is *not* an effective method for communicating outside the project group. Instead, boundary spanning project members are needed to link project teams effectively to outside sources of relevant information. As discussed by Allen (1977) and Katz and Tushman (1979), special project members, labelled gatekeepers, are needed to link project colleagues to key sources of information both inside and outside the organization. Other project members, labelled internal liaisons, link project colleagues only to sources of information within the organization. Outside information is transmitted effectively into project groups through both types of boundary spanning individuals (Tushman, 1977). First, gatekeepers and internal liaisons gather and understand relevant outside information; subsequently they channel it in more meaningful terms to their project colleagues. Boundary spanning individuals, then, perform an extremely valuable function, for they are the principal means by which outside ideas and information are transferred effectively into RD&E project groups (Allen & Cohen, 1969; Katz & Tushman, 1981). Although gatekeepers and internal liaisons connect project colleagues to important information sources within the organization, only gatekeepers provide an effective interface with technical knowledge and advancements outside the organization (Tushman & Scanlan, 1981).

Most boundary spanning individuals in RD&E are also project supervisors, although supervisory status per se does not automatically result in high communication activity either within or across organizational boundaries. Rather, project supervisors who are seen as technically competent, who keep up-to-date, and who are seen as valuable sources of ideas and information are likely to become boundary spanning individuals simply because they will be consulted and listened to more frequently on work related matters (Rosen, Billings, & Turney, 1976). Previous research, in fact, has shown that between 70 and 80 percent of the boundary spanning individuals also are first level project supervisors. In contrast, only about half of the project supervisors perform a boundary spanning function (Allen, 1977; Schwartz & Jacobson, 1977; Tushman & Scanlan, 1981).

Even though boundary spanning has been recognized as one of the more important elements of effective leadership and managerial behavior (Graen & Ginsburgh, 1977; Likert, 1967; Mintzberg, 1973), very little is known about how boundary spanning activity relates to other important managerial functions. In addition to enhancing project effectiveness, would boundary spanning project supervisors also be more likely to affect the work activities and careers of those project members reporting to them?

Research over the past 15 years has demonstrated that interpersonal communications are the primary means by which engineering professionals acquire and disseminate important ideas and information (Allen, 1977; Katz, 1982a; Menzel, 1966). Moreover, it is through such social processes that most professionals come to learn the norms, values, and operating rules of their organization (Katz, 1980; Kerr, 1977). Rather than relying on written technical reports, publications, or other formal structures, professionals in RD&E keep abreast of new technical developments and organizational demands through informal contact and personal associations with other RD&E professionals (Allen, 1977; Farris, 1972).

If interpersonal contact and interaction are key determinants of integration and socialization in RD&E and if boundary spanning supervisors are critical players in the laboratory's communication and information processing network, then these supervisors are doing much more than simply channeling outside information into their project groups. Most likely, they are assuming a broader role within their work groups, becoming actively involved in the training, integration, and socialization of their subordinates. Katz and Tushman (1981) found, for example, that gatekeeping supervisors not only gathered and disseminated external information, but they also improved the external interface of their engineering subordinates by helping to direct, coach, and interpret their external communications.

As a result of their elaborate outside contact and close working relationships with project subordinates, boundary spanning supervisors not only improve their group's technical performance (Tushman & Katz, 1980), but they also may directly affect the personal growth and development of project members. To the extent that boundary spanning supervisors help project members participate and contribute more effectively within their work settings, have clearer working relationships with other corporate areas, and communicate more easily with outside professionals, project members are less likely to leave the organization (Farris, 1971; Graen & Ginsburgh, 1977; Pelz & Andrews, 1966).

Boundary spanning supervisors also are highly influential in technical, administrative, and personnel decision making (Tushman & Romanelli, 1983). Consequently, engineers assigned to work with these supervisors have better chances at gaining increased exposure and more extensive work opportunities. If boundary spanning supervisors are influential and provide their subordinates with better opportunities, then engineers working for these particular supervisors should have a greater rate of promotion. Based on these arguments, the following are hypothesized:

1. *Project members working for boundary spanning supervisors are more likely to remain with the organization than are project members working for supervisors who are not boundary spanners.*
2. *Project members working for boundary spanning supervisors are more likely to receive promotions to management than are project members working for supervisors who are not boundary spanners.*

These turnover and promotion effects are proposed for project members in general. Young employees, however, are more likely to benefit from the socialization and developmental role played by boundary spanning supervisors (Berlew & Hall, 1966). Most turnover occurs within the first few years of organizational employment (Schein, 1978). In addition, engineers usually expect promotions to managerial rank sometime between the ages of 30 and 40 (Dalton, Thompson, & Price, 1982; Ritti, 1971). It therefore is expected that the proposed relationships will be particularly strong for younger project members. Accordingly, the hypotheses will be tested for the full sample of professionals and for project members of different age groups.

Project Task Characteristics

Although the importance of boundary spanning has been well demonstrated, recent research indicates that not all RD&E projects are alike in the way they function or in the way they should be managed (Allen, Tushman, & Lee, 1979). Because of differences in work requirements, there are substantial information processing differences among groups engaged in research, development, and technical service kinds of activities.

In research activity, project members are less constrained by local organizational circumstances because the nature of their work is more universally defined. As a result, research project members can communicate effectively with professional colleagues outside the organization without the help of gatekeepers. In fact, Tushman and Katz (1980) found that research teams relying on boundary spanning gatekeepers were significantly less effective than research terms in which members kept themselves up-to-date and maintained their own external contacts. Nevertheless, research teams must be linked to other organizational areas; and evidence suggests that given the researcher's more cosmopolitan perspective, boundary spanning supervisors are an effective way to ensure their organizational coordination (Allen et al., 1979).

Development projects, on the other hand, involve less universally defined tasks in that their problems and solution strategies are defined and operationalized in terms of the organization's particular strengths, interests, language schemes, and cultural norms. Because of this local orientation, communication across organizational boundaries becomes extremely difficult and ineffective for most development project members (Allen, 1977; Baker, Siegmann, & Rubenstein, 1967). Despite this difficulty, development groups must stay well informed about technical developments outside their organization and must maintain close ties with other organizational areas, marketing and operations in particular. Boundary spanning project members are needed for effective linkage of development groups with these critical information areas (Katz & Tushman, 1981).

Although technical service projects are more local in nature, their work deals with more mature technologies and existing knowledge and products

(Rosenbloom & Wolek, 1970). As a result, members of technical service projects can rely more easily on established practices and procedures. In technical service work, therefore, boundary spanning individuals are not necessary because project members can be kept sufficiently informed about external events and information through formal hierarchies and operating procedures (Tushman & Katz, 1980; Walsh & Baker, 1972).

If boundary spanning supervisors are more critical and influential in development work than in either research or technical service, then their influence on the career outcomes of engineering subordinates also should be particularly important in development projects. As a result, the following hypothesis is suggested:

> 3. *Project work characteristics will moderate the effects that boundary spanning supervisors have on the turnover and promotion of engineering subordinates. The influence of such supervisors will be stronger in development projects than in either research or technical service.*

Alternative Comparisons

To what extent are promotions simply a function of working for supervisors who are themselves promoted to higher managerial positions? Webber (1976) suggested that working for highly promotable supervisors enhances one's own chances of promotion. Boundary spanning supervisors usually are promoted (Allen, 1977; Katz & Tushman, 1981), but they comprise only a subset of supervisors who receive promotions over a given time frame. The present study investigates whether there is a particular benefit in working for boundary spanning supervisors rather than for any project supervisor who gets promoted. Furthermore, it is possible that being assigned to a high performing project group affects the turnover and promotion opportunities of young project members more than do the technical and interpersonal skills of their boundary spanning supervisors. The hypothesized relationships, therefore, also are tested and compared against the effects of working in high performing project teams.

Method

Setting

This study was conducted among all project members working in a large corporate RD&E facility. At the start of the study, the facility's professionals ($N = 325$) were divided into seven separate functional departments, which in turn were subdivided into 61 projects organized around specific, long term types of discipline and product focused problems. Each professional was a member of only one project group.

Five years after the initial data collection period, the titles and positions of those professionals still employed by the organization were obtained.

Although the RD&E facility nearly doubled in size during this interval, longitudinal examinations reported here focus on the career histories of only those professionals employed at the start of the study. In addition, 8 percent of the project members retired during the 5-year period and consequently were excluded from all analytical investigations.

Communications, Gatekeepers, and Internal Liaisons

To measure communication activity, project members reported (on specially provided lists) those individuals with whom they had work-related oral communication on a randomly chosen day each week for 15 weeks, including whom they talked to and how many times they talked to that person during the day. Social and written communications were not reported. During the 15 weeks, the overall response rate was 93 percent. Moreover, 68 percent of all communications within the RD&E facility were reciprocally reported by both parties. As discussed by Katz and Tushman (1979), all communication data were used as reported. Given systematic bias in self-report data (e.g., supervisors overreport communication from subordinates), a 68 percent reciprocity rate over many thousands of communications represents a high level of internal reliability and provides a clear, accurate picture of each project member's communication patterns.

For each project member, six mutually exclusive communication measures were operationalized as follows:

1. *Departmental communication:* The amount of communication with other nonsupervisory engineering colleagues within his or her functional department including project colleagues.
2. *Laboratory communication:* The amount of communication with other engineering colleagues within the remaining six functional departments.
3. *Immediate supervisory communication:* The amount of communication with his or her immediate project supervisor.
4. *Departmental supervisory communication:* The amount of communication with his or her departmental supervisor.
5. *Corporate communication:* The amount of communication with other individuals outside the RD&E facility but within other corporate divisions, primarily marketing and manufacturing.
6. *External professional communication:* The amount of communication with other RD&E professionals outside the parent organization, including professionals within universities, consulting firms, and various professional societies.

For each project engineer, the amount of communication to these two horizontal, two vertical, and two outside sources of information was calculated by summing the number of interactions reported during the 15 weeks (see Katz and Tushman, 1979, for details). Except for the high positive correlation between departmental and immediate supervisory communication ($r = .34$), the six measures were not significantly associated with one another.

Conceptually, gatekeepers are defined as those project members who are very high internal communicators and who also maintain very high external contacts with outside professionals. This study operationalized gatekeepers as those project members whose departmental and external professional communications were both in the top fifth of their respective distributions (Katz & Tushman, 1981; Whitley & Frost, 1973). Internal liaisons, on the other hand, were defined as those project members who were in the top fifth of both their departmental communication distribution and their communications to other functional departments and organizational divisions (Allen & Cohen, 1969; Tushman & Scanlan, 1981). Based on these definitions, 18 percent ($n = 11$) of the project supervisors functioned only as internal liaisons, 13 percent ($n = 8$) functioned only as gatekeeping supervisors, and 11.5 percent ($n = 7$) fulfilled both the gatekeeping and internal liaison roles. The remaining project supervisors ($n = 35$) were not performing a boundary spanning function either as a gatekeeper or as an internal liaison. Finally, in one of these 35 cases, the position of project manager was held temporarily by the departmental supervisor. Engineers from this group, as a result, were not included in any statistical comparisons involving prior reporting relationships.

Project Characteristics

As previously discussed, RD&E projects differ widely with respect to the generation of knowledge versus the utilization of existing knowledge and experience. Based on this dimension, project categories were organized around research, development, and technical service kinds of project activities. Using definitions described in Katz and Tushman (1979), project members indicated how well each category represented the objectives of their project work. As in Pelz and Andrews (1966), project members also indicated the percentage of their project activities that fell into each of the possible project categories. A weighted average of the answers to these two questions was calculated for each project member (Spearman-Brown reliability = .91).

To categorize projects empirically, project member responses were averaged to yield 14 research, 24 development, and 23 technical service project groupings. As discussed by Tushman (1977), the homogeneity of members' perceptions of their project characteristics also was checked to ensure the appropriateness of aggregating across individual scores.

Project Performance

To get comparable measures of project performance across significantly different technologies, all departmental and laboratory managers ($N = 9$) were interviewed individually and asked to evaluate the overall technical performance of all projects with which they were sufficiently familiar. When they could not make an informed judgment, they did not rate that project.

Each project was independently evaluated by an average of five managers using a 7-point Likert type scale ranging from (1) very low to (7) very high. Individual ratings were averaged to yield overall project performance scores (Spearman-Brown reliability = .81). To classify project members according to whether they were working in a high or low performing project team, project groups were split at the sample mean of 4.59.

Promotion and Turnover

Almost five years after the collection of the preceding data, data on managerial promotions and turnover were gathered. Despite the facility's strong growth, 31 percent of the project members and 19 percent of the project supervisors had left the company during this time interval. Furthermore, among the 15 gatekeepers and 18 internal liaison supervisors, the turnover rates were 20 and 17 percent, respectively.

In this organization, managerial positions and titles start within the department above the project supervisory level. During the 5-year interim period, 11 percent of the project members and 46.5 percent of the project supervisors had been promoted to management positions. Although less than half of the project supervisors had received management promotions, 73.3 percent of the gatekeeping subset and 67 percent of the internal liaison subset had been promoted to management levels.

Results

Turnover

The first hypothesis was concerned with the influence of boundary spanning supervisors on the turnover rates of project engineers. Table 1 reports the percentages of project members who remained with the organization over the 5-year period as a function of their prior type of supervision. For the sample as a whole, project members who reported to gatekeeping supervisors had a significantly lower rate of organizational turnover than did engineers assigned to supervisors who were either nonboundary spanners or only internal liaisons. Engineers who reported to internal liaisons had the lowest retention rate over the 5-year period (only 62 percent); those who reported to gatekeeping supervisors or supervisors who were *both* gatekeepers and internal liaisons had the highest retention rates (82 and 85 percent, respectively). Clearly, gatekeepers had a more positive effect on retention rates than did internal liaisons. Furthermore, project members assigned to those supervisors who received promotions did not stay with the organization any longer than did members who worked for unpromoted supervisors (Table 1B). Similarly, engineers who worked in high performing projects did not remain with the organization any longer than did those who worked in low performing projects (Table 1C).

Table 1
Supervisory Influence on the Proportion of Engineers Remaining in the Organization Over a 5-Year Period

	A. Prior Type of Reporting Relationship: Engineer Worked for a Supervisor Who Was:			
	Internal Liaison	*Gatekeeper*	*Gatekeeper and Internal Liaison*	*Neither a Liaison nor a Gatekeeper*
% Remaining in organization after 5 years (*N*)	62%[b] (45)	82%[a] (28)	85%[a] (20)	70%[b] (115)

	B. Did Engineer Work for a Supervisor Who Was Subsequently Promoted to a Managerial Position?		*C. Did Engineer Work in a Project That Was:*	
	Yes	*No*	*High Performing*	*Low Performing*
% Remaining in organization after 5 years (*N*)	67.6% (102)	71.7% (106)	73.7% (114)	63.5% (104)
	Not significantly different		Not significantly different	

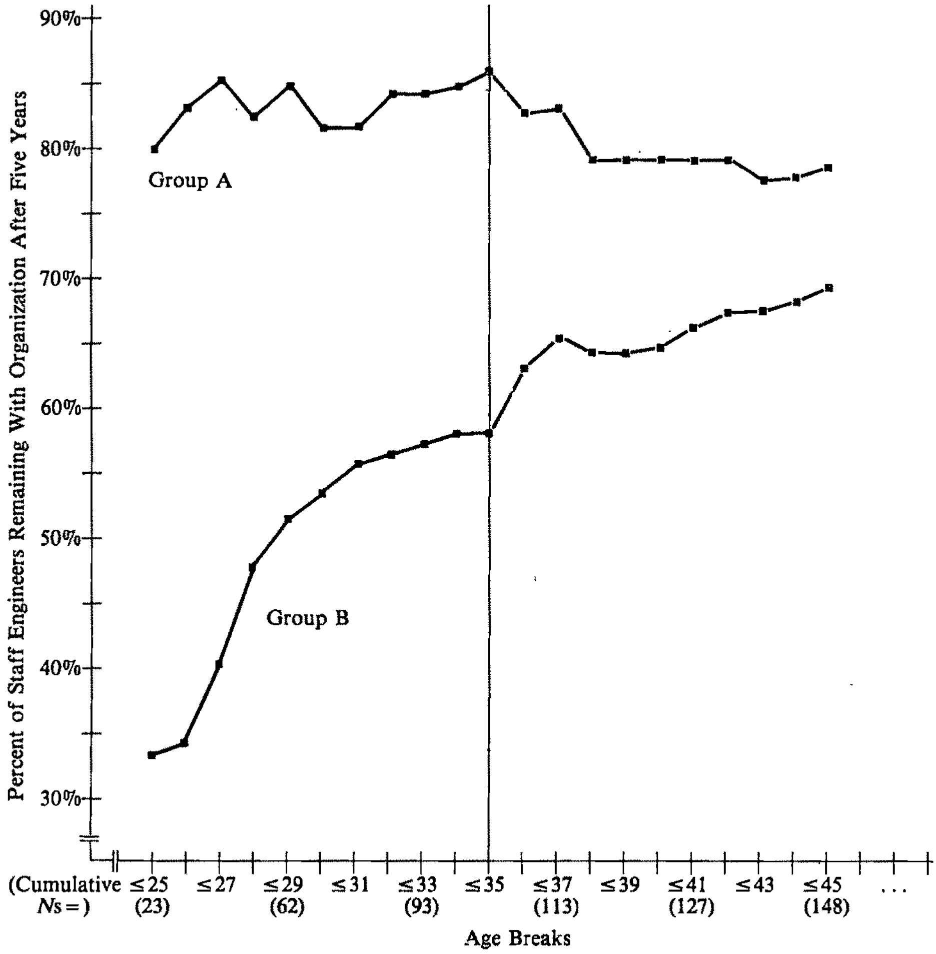
[a,b] Based on *t*-tests, percentages superscripted "a" are significantly greater than those superscripted "b" ($p<.10$).

N: The *N*s in sections A and B are based on engineers from only 60 projects. In section C, *N* is based on engineers from all 61 projects.

Because 70 percent of the turnover occurred for project members less than 36 years of age, additional comparisons were carried out for separate age groupings. Except for gatekeeping supervisors, these additional comparisons failed to uncover any significant turnover differences among prior types of reporting relationships or between high and low project performance. To pinpoint the influence of gatekeepers on subordinate turnover, Figure 1 plots as a function of age the cumulative retention rates of project members reporting to gatekeeping supervisors (Group A) and those members not reporting to gatekeeping supervisors (Group B). In Figure 1, as well as in the rest of this paper, the term gatekeeping supervisors refers to supervisors who were either functioning only as gatekeepers or functioning simultaneously as gatekeepers and internal liaisons. Nongatekeeping supervisors refers to the rest of the supervisory population.

Of those project subordinates who were age 25 or less, only 33 percent remained in the organization if they had *not* reported to a gatekeeping supervisor. The comparable percentage for project members assigned to a gatekeeping supervisor was almost 80 percent. Similarly, of those project subordinates who were 35 years old or less, only 57 percent remained with the organization if they had *not* been working with a gatekeeping supervisor. The comparable percentage in Group A was 84 percent. Although this difference is statistically significant, the figure clearly shows that most of the difference in retention rates between Groups A and B occurs among members between the ages of 25 and 29. Retention rates between the two groups converge rather quickly after age 35.

Figure 1
Retention of Engineers After Five Years
by Prior Type of Reporting Relationships at Successive Age Breaks[a]



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[a] Group A: staff engineers who reported directly to a gatekeeping supervisor; Group B: staff engineers who reported directly to a nongatekeeping supervisor. The vertical line indicates that pairwise percentages between Groups A and B remained significantly different ($p < .05$) through an age break of 35 years. *N*s represent the total number of engineers within both groups at six representative age breaks.

Based on the curves in Figure 1, there appear to be at least three distinct age breaks: (1) less than 30; (2) 30-35; and (3) 36 or more. Using these age breaks, Table 2 shows that project subordinates less than 30 years of age were significantly more likely to remain in the organization if they had been working with a gatekeeping supervisor. Over 84 percent of these engineers were still with the organization after five years versus only 51 percent for the parallel group of young engineers not reporting to gatekeeping supervisors.

Table 2
Proportion of Engineers Remaining in the Organization After Five Years by Prior Age and Reporting Relationship

	Prior Reporting Relationship Percent		
Prior Age of Engineers	*Assigned to a Gatekeeping Supervisor*	*Not Assigned to a Gatekeeping Supervisor*	*Percent Differences*
Less than 30	84.6 ($n=13$)	51.0 ($n=49$)	33.6*
Between 30 and 35	83.3 ($n=12$)	66.7 ($n=27$)	16.6
Greater than 35	78.3 ($n=23$)	78.6 ($n=84$)	.3

*$p<.05$

Similar significant differences in turnover, however, did not emerge between project members for each of the two remaining age categories.

In project groups, individuals functioning as gatekeepers are not always the project's supervisor. In the sample, there were five projects in which one of the members, and not the project supervisor, was functioning as a gatekeeper. Although this number of cases is rather small, the turnover pattern of engineers from these five groups was nearly the same as the turnover pattern from projects without any gatekeeper. For members less than 35 years of age, for example, the 5-year retention rate from projects without gatekeepers was 56 percent; the comparable retention rate from the five projects that had only a nonsupervisory gatekeeper was also low, only 58 percent. The retention rate with a gatekeeping supervisor was significantly higher at 84 percent. Although collegial gatekeepers are important in obtaining needed technical information, apparently only a gatekeeping supervisor has strong positive effects on early socialization and developmental processes.

Although gatekeeping supervisors may have led to reduced turnover levels among young project subordinates, Hypothesis 3 suggests that these effects might be stronger for members of development project groups. This possibility is reported in Table 3, which compares the turnover rates of project engineers less than 30 years of age for each project category. The turnover differences between project subordinates with and without gatekeeping supervisors was consistently positive for each project area, although the small number of cases precludes statistical testing. For each project area, approximately half of the young project members not reporting to a gatekeeping supervisor had left the company within five years despite substantial growth within the RD&E facility. In sharp contrast, none of the corresponding turnover rates for project members reporting to a gatekeeping supervisor exceeded 25 percent.

Clearly gatekeeping supervisors had considerable influence over the turnover rates of young professionals within this facility. What is it about gatekeeping supervisors that brings about these lower levels of turnover? As previously discussed, turnover may be a function of how well young

Table 3
Proportion of Young Engineers (<30) Remaining in the Organization After Five Years by Prior Reporting Relationship and Project Task Areas[a]

Prior Project Areas	Prior Reporting Relationship Percent: Assigned to a Gatekeeping Supervisor	Prior Reporting Relationship Percent: Not Assigned to a Gatekeeping Supervisor	Percent Differences
Applied research	83.3 ($n=6$)	44.4 ($n=9$)	38.9
Product/process development	75.0 ($n=4$)	53.8 ($n=26$)	21.2
Technical service	100.0 ($n=3$)	50.0 ($n=14$)	50.0

[a] Because of small sample sizes, statistical tests are not used; instead, the focus is on the overall consistent pattern of positive proportional differences.

professionals get integrated into their organization's formal and informal networks. Because gatekeepers are key individuals in these networks, reporting to a gatekeeping supervisor may well facilitate the young professional's linkages to important information sources both within and outside the organization. An investigation was made as to whether young project members reporting to gatekeeping supervisors had different interaction patterns than did project members reporting to nongatekeeping supervisors. Table 4 reports mean communication scores broken down by supervisory relationships and turnover. Separate comparisons are reported for communication to each of the six information sources used in the study.

As shown in Table 4, there were no significant differences between the communication patterns of young engineers who worked for gatekeeping supervisors and those who worked for nongatekeeping supervisors. Their levels of interaction were very similar in each communication area. Furthermore, regardless of their supervisory reporting relationship, project members who either stayed or left did not differ in the intensity of their prior horizontal collegial interactions or in their contacts with individuals and professionals outside the RD&E facility. What differentiated young stayers from leavers was their level of contact with their project and departmental supervisors; that is, their degree of vertical communication and integration. For both gatekeeping and nongatekeeping relationships, project subordinates who remained over the five years had significantly more communication with their departmental supervisor than did project members who left. Stayers also had more interaction with their project supervisors, although the difference was not quite significant for members who reported to nongatekeeping project supervisors.

What are the relative effects of prior communication and reporting relationships on subsequent turnover? A hierarchical discriminant analysis was run on the turnover outcomes of the 62 project members less than 30 years of age using the six communication measures and the prior reporting

Table 4
Mean Communications of Young Engineers (<30 years) Broken Down by Prior Reporting Relationship and Subsequent Turnover

Prior Measures of Communication (per Month)	Prior Reporting Relationship	
	Assigned to a Gatekeeping Supervisor	Not Assigned to a Gatekeeping Supervisor
Horizontal communications with:		
1. Departmental colleagues		
a. Engineers who remained	117.8	104.8
b. Engineers who left	110.2	113.4
2. Laboratory colleagues		
a. Engineers who remained	28.2	26.3
b. Engineers who left	27.1	24.8
Vertical communications with:		
3. Immediate supervisor		
a. Engineers who remained	30.1[a]	27.6
b. Engineers who left	8.8[b]	19.0
4. Departmental supervisor		
a. Engineers who remained	4.9[a]	3.6[a]
b. Engineers who left	0.0[b]	1.2[b]
Outside communications with:		
5. Other corporate areas		
a. Engineers who remained	17.9	20.8
b. Engineers who left	25.8	17.4
6. External professionals		
a. Engineers who remained	1.1	2.1
b. Engineers who left	5.8	2.0

[a,b] For each pair, communication means superscripted "a" are significantly greater than those superscripted "b" ($p<.05$). *N*s can be found in Table 2.

relationship (coded "1" and "0" for working with and without a gatekeeping supervisor) as possible differentiating variables. After both measures of vertical communication entered the discriminant analysis significantly, none of the remaining independent variables, including reporting to a gatekeeping supervisor, accounted for any significant amount of additional discrimination between stayers and leavers. Using the Wilks' Lambda criterion, the discriminant function containing both vertical communication variables was significant at the $p<.05$ level ($\chi^2=6.13$; $df=2$) and correctly classified 74 percent of the project subordinates. Thus, it is not the assignment of young project members to a gatekeeping supervisor per se that enhances long term retention. What really makes the difference is the high level of vertical interaction that takes place between gatekeeping supervisors and their young engineering subordinates.

In testing the hypotheses, it is important to mention that age really serves as a surrogate means for examining employees at similar career stages. Strictly speaking, several cohorts of employees at different career stages would be the most advantageous method for testing the influence of gatekeeping on project subordinates. In a field study of this sort, however, such cohorts are unavailable. Furthermore, there simply were not enough turnover cases, especially with gatekeeping supervisors, even to begin to determine whether age, tenure, or some other career variable is most appropriate. In any event, age and tenure are so highly congruent for very young employees that any distinction would be primarily conceptual rather than yielding any clear empirical differences.

Managerial Promotion

During the five years, 23 of the project members were promoted to managerial positions. Table 5 reports promotion percentages for different types of prior reporting relationships. As with turnover, project members who reported to gatekeeping supervisors had a significantly higher rate of promotion than did project members who reported to other kinds of supervisors, including internal liaisons. Furthermore, individuals assigned to supervisors who were subsequently promoted were no more likely to get promoted than were individuals who worked for unpromoted supervisors. Similarly, individuals from high performing projects did not receive proportionately more promotions than did individuals from low performing projects.

Table 5
Supervisory Influence on the Proportion of Engineers Promoted to Managerial Level Positions Over a 5-Year Period

	A. Prior Type of Reporting Relationship: Engineer Worked for a Supervisor Who Was:			
	Internal Liaison	*Gatekeeper*	*Gatekeeper and Internal Liaison*	*Neither a Liaison nor a Gatekeeper*
% Promoted to managerial positions after 5 years	11.1%^{b}	14.3%^{a}	15.0%^{a}	11.3%^{b}

	B. Did Engineer Work for a Supervisor Who Was Subsequently Promoted to a Managerial Position?		*C. Did Engineer Work in a Project That Was:*	
	Yes	*No*	*High Performing*	*Low Performing*
% Promoted to managerial positions after 5 years	11.8%	10.4%	9.6%	12.5%
	Not significantly different		Not significantly different	

^{a,b}Based on t-tests, percentages superscripted "a" are significantly greater than those superscripted "b" ($p < .10$).

N: The *N*s in sections A and B are based on engineers from only 60 projects. In section C, *N* is based on engineers from all 61 projects.

Because almost 70 percent of the project members promoted to managerial positions were between the ages of 27 and 32 at the start of our study, the data within this more limited age range were reanalyzed. As before, the various types of reporting relationships revealed no important effects on promotion rates within this restricted subsample, except for the comparison of gatekeeping versus nongatekeeping supervisors (Table 6). For this

Table 6
Proportion of Engineers Promoted to High Level Managerial Positions Over the Next Five Years by Prior Reporting Relationship and Project Task Areas[a]

	Prior Reporting Relationship Percent		
Prior Project Areas	*Assigned to a Gatekeeping Supervisor*	*Not Assigned to a Gatekeeping Supervisor*	*Percent Differences*
Across all areas	41.2 ($n = 17$)	17.4 ($n = 46$)	23.8*
By project area			
Applied research	33.3 ($n = 6$)	20.0 ($n = 10$)	13.3
Product/process development	66.7 ($n = 6$)	18.5 ($n = 27$)	48.2**
Technical service	20.0 ($n = 5$)	11.1 ($n = 9$)	8.9

[a]Table includes only those engineers in the age range (27 through 32) in which almost 70 percent of the promotions took place.
*$p < .10$
**$p < .05$

comparison, the difference was significant; for project members who reported to a gatekeeping supervisor, the promotion rate was 41.2 percent, whereas only 17.4 percent of the engineers who reported to a nongatekeeping supervisor were similarly promoted.

Although proportionately more engineers who had reported to gatekeepers were promoted to management within this general subsample, Table 6 shows that most of this difference can be found in the area of product and process development. No significant advantage was found in the promotion rates of project engineers reporting to gatekeepers in either research or technical service areas. On the other hand, two-thirds of the engineers reporting to gatekeepers in development projects received management promotions, in contrast to only 18.5 percent of the engineers reporting to nongatekeepers, although once again the number of cases is rather small. Nonetheless, development work is precisely the project area in which gatekeepers presumably are most necessary and influential and in which they were hypothesized to have the strongest influence over managerial promotions.

As in the turnover analyses, the communication patterns of project members within the 27-32 year old age range were examined to see if those promoted also had differential patterns of contacts and interactions within their work settings. None of the communication measures, however, was significantly related to managerial promotions for these individuals.

Discussion

The research findings presented here support the idea that supervisory behavior is an important factor in the making of one's organizational and professional career. Not all supervisors in the study, however, had comparable relationships with the career outcomes of their engineering subordinates. Only boundary spanning gatekeeping supervisors were significantly associated with reduced turnover rates and higher rates of subordinate promotion to management. These associations, moreover, were particularly strong for young professionals. They disappeared for older, more experienced engineers.

On a percentage basis, more young engineers who had gatekeeping supervisors remained with the firm than did those whose supervisors were not gatekeepers. Why were these gatekeepers so strongly related to lower levels of turnover? Was it the result of their supervisory status, their technical ability, or their outside professional contacts? These characteristics certainly are important, but the results on communication suggest that gatekeepers were related to the low turnover among their young project subordinates because of the high levels of hierarchical interaction and activity that took place between them. Because gatekeeping supervisors are technically competent, interpersonally active, and they readily identify with the professional orientations of young engineers, they establish close working relationships with most of their project subordinates, almost 85 percent in the study. It was this high level of hierarchical activity and concern that discriminated between young engineers who stayed and those who left. In the relatively few cases in which gatekeeping supervisors either failed to communicate or denied access to their young subordinates, these individuals probably became disenchanted, gave up, and left. Thus, it may not be the gatekeeping role or supervisory status per se that is related to turnover. In line with the findings of Graen and Ginsburgh (1977), what seems most beneficial are high levels of work-related contact and involvement with relevant competent supervisors—interactions that occur most frequently with gatekeeping supervisors.

In addition to these turnover relationships, gatekeeping supervisors were linked to the managerial promotions of project subordinates who were between the ages of 27 and 32 at the start of the study. Within this age range, project members working for gatekeeping supervisors attained a significantly higher rate of promotion to management than did project members working for nongatekeeping supervisors. Furthermore, the promotion rate for young project members reporting to gatekeepers in development areas was more than three times the promotion rate of development project members assigned to nongatekeeping supervisors. In development work, gatekeepers are highly influential individuals who strongly enhance project performance by connecting engineers to more useful ideas and information outside the project. Having better access to critical information, along with working for influential supervisors, may be associated with greater work opportunities and organizational visibility which, in turn, lead to higher rates of management promotion.

Implications and Conclusions

From a broader perspective, the relationship between lower turnover and high interpersonal involvement with gatekeeping supervisors affirms the important role that project supervisors can and should play during the early socialization years of young professionals. As discussed by Schein (1978) and Katz (1980), young employees build perceptions of their work environment and establish their new organization identities through the plethora of interactions and interpersonal activities that take place during the early years of their laboratory integration. Young engineers, therefore, not only need to interact with their colleagues and peers, but they also require considerable interaction with and feedback from relevant supervisors to learn what is expected of them and to decipher how to be a high performing contributor.

Because they are well-connected professionally and organizationally, gatekeepers are particularly qualified to meet the breaking-in concerns of young professionals, directing and coupling the professional orientations of young engineers with a more appropriate organizational focus. Most likely, the high level of interpersonal contact between gatekeeping supervisors and young project engineers not only facilitates socialization but also results in more accurate expectations, perceptions, and understanding about one's role in the project and in the larger organization—all of which are important in decreasing the turnover of newcomers (Katz, 1980; Pondy, 1978; Wanous, 1980).

These results, then, combined with other research evidence—for example, Dalton et al. (1982), Graen and Ginsburgh (1977), and Vicino and Bass (1978)—indicate that becoming an integral part of an organization's communication and information processing networks and learning the organization's customs and norms are critically important during the early stages of employees' careers. Although socialization can take place in many different ways, gatekeeping supervisors appear particularly important in the organizational integration of young engineering subordinates, helping them understand and interpret the reality of their new settings in order to function more fully and meaningfully within the organization. Gatekeeping supervisors, then, fulfill an important leadership and training function for young engineers, operating effectively as important socializing agents and network builders for these young employees.

Organizations have to recognize that the problems and concerns of young engineers are real and must be dealt with before they become effective organizational members. Although specific training programs could be developed to teach project managers how to "break-in" the young engineer more effectively, the careful selection of supervisors for young professionals also would go a long way toward alleviating many of the problems that usually occur during this joining-up process.

It also is important to note that gatekeeping supervisors were not related to the career outcomes of their older employees. Individuals in the innovation or stabilization phases of their careers have a more clearly developed sense of personal identity and organizational reality—their reputations and areas of contribution being more firmly defined (Katz, 1982b). As a result, the turnover and promotion rates of these more established veterans may be influenced more by individual differences and by task and organizational factors than by the characteristics of their immediate supervisors.

Finally, one should realize that in a longitudinal field study of this sort, the random assignment of project members to gatekeeping and nongatekeeping supervisors was not possible. Although the thinking here emphasizes the direct role that gatekeepers might play in influencing project members' careers, it also is possible that gatekeepers either attracted or were assigned members who were more likely to stay or were of higher promotion potential. Furthermore, other uncontrolled organizational factors could have influenced the results. For example, data were not collected on how long project members worked for their respective supervisors. What is known is that project members who reported to gatekeeping supervisors early in their careers had more successful organizational outcomes. It remains for future research to look even more closely at these types of relationships. Even with these traditional caveats, substantial research and practice strongly indicate that gatekeepers are extremely important in RD&E settings, not only for the effective transfer and processing of outside technical information, but also in the socialization and development of young engineers.

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Potential Problems with Peer Ratings[1]

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A study of the reactions of workers to evaluations by their peers found that negative peer rating feedback produced significantly lower perceived performance, cohesiveness, satisfaction, and peer ratings on a subsequent task. Positive peer rating feedback produced higher but nonsignificant values for these variables on a subsequent task.

Peer ratings can be defined as the set of evaluations obtained by having each member rate every other member of a work group, using a specific set of rating scales. A considerable amount of research has been conducted on peer ratings and peer evaluations in general (Brief, 1980; Kane & Lawler, 1978, 1980). However, virtually no research has been reported on how people react on learning they have been either poorly or favorably evaluated by their peers. What effects do these ratings, or other types of peer evaluations (especially when they are negative) have on subsequent interactions, feelings, performance, and any future evaluations?

There is a theoretical basis for anticipating problems following an individual's receiving negative evaluations from peers. Balance, or consistency theories (Osgood & Tannenbaum, 1955; Rosenberg, Hovland, McGuire, Abelson, & Brehm, 1960), for example, would suggest that learning someone has evaluated an employee more poorly than he/she would evaluate himself/herself will lead to "source derogation" (Tannenbaum, 1978), or the lowering of the employee's opinion of the rater and any subsequent evaluations of that rater. The notion of reciprocity in social exchange (Adams, 1965) also suggests that one would "repay" a peer for a poor rating by later giving poor ratings to that peer. Finally, consistency theories would lead one to expect other outcomes following source derogation. For example, there is reason to believe that learning of poor peer evaluations will result in those peers becoming less interpersonally attractive (Kiesler & De Salvo, 1976), which tends to reduce cohesiveness among group members

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(Zajonc, 1962). This reduction in cohesiveness can have serious consequences for the performance of interacting groups (Stogdill, 1972).

There also are empirical data to indicate that people retaliate against peers after receiving negative ratings. Koeck and Guthrie (1975), for example, reported that subjects lowered subsequent personality ratings of peers by giving them more negative ratings after learning those peers had rated them negatively. They did not, however, raise subsequent ratings after learning that peers rated them positively. Bernardin (1980) found similar results of retaliation for poor supervisory evaluations, citing a relationship between the ratings a supervisor gives a subordinate and the subordinate's description of the supervisor's leadership style. This potential for retaliation probably is more serious in the case of peer ratings, however, because the ratee may well have the opportunity to repay the rater in kind.

Thus, there is some reason to expect that learning of negative peer ratings will lead to retaliation during subsequent evaluations, lower group cohesiveness, and perhaps will even cause poorer performance for interacting groups. Nonetheless, no research is known that has directly examined any of these possibilities. It also should be noted that people may react to peer ratings in ways much different from those discussed above. Negative ratings, especially if one feels them to be unjustified, could be viewed as an attack on self-esteem. A number of studies reviewed by Korman (1970) suggested that persons might react to such an attack by working even harder to demonstrate their competence. This is, after all, what would be hoped for as a result of negative evaluations. Conversely, it is possible that positive peer evaluations could produce too much cohesiveness, which, if the group was not particularly motivated to perform well, could result in less task oriented interaction and consequently poorer performance (Stogdill, 1972). These outcomes must be acknowledged as possibilities, although they seem less likely, given the research results reviewed above.

The present study is a laboratory experiment that investigated effects of peer evaluations on group behavior and performance. The following general hypothesis is tested:

> *Knowledge of peer ratings will affect ratings of group cohesiveness, satisfaction, group interactions, and group performance (both perceived and actual) on a subsequent task.*

It thus is predicted that there will be positive effects for individuals who learn that their peers have rated them positively (i.e., various rating "scores" will improve) and negative effects for individuals who learn that their peers have evaluated them negatively. Furthermore, following the results reported by Koeck and Guthrie (1975), it is predicted that the effects following negative peer ratings will be relatively stronger than the effects following positive peer ratings.

Method

Subjects and Procedures

A total of 143 undergraduate students (68 female) participated in a laboratory experiment in partial fulfillment of course requirements. All subjects worked in one of 34 small groups of 3 to 5, depending on the number reporting for a particular session. Preliminary analyses indicated no effects for subject sex, the sex composition of the groups, or any sex × condition interactions. In addition, there were no effects for group size. Thus all results are presented for the total sample.

On reporting, subjects were given a general description of the procedures to be followed and were told that they would be working as a group on two tasks. Following each task they would be asked to complete a questionnaire that included an evaluation of every other member of their group by name. They also were informed that each person would be shown the evaluations, but only the mean rating received, so that individuals could not tell how any one person rated them. (Of course, in smaller groups, a group member receiving negative feedback would know that no peer could have rated him or her as an outstanding performer.) Subjects also were informed that two persons would be observing their group from behind a one-way glass, but the observers' only role was to record group interactions. After questions were answered, subjects were asked to sign informed consent forms. There was no penalty for refusal to participate. Alternatives were available for students to satisfy this portion of their course requirement.

The two group problems were variations of a truck routing task developed by DeNisi and Pritchard (1978), which required subjects to map a cross-country route to maximize, within certain constraints, the value of the cargo trucked. The two variations were pretested to insure equivalence. This particular task was appropriate for the present study because several distinct pieces of information had to be considered, and up to five people each had to assume a real role within the group. The task also required coordination among group members so that members had continuous interaction. It therefore was impossible for any one person to perform the task alone, and it was difficult for any one member to be disassociated from the outcome, which clearly is a group product. Finally, based on extensive pretesting of the original task, subjects had no feel for the number of points (measuring the value of the cargo) that were needed to represent good or poor scores. Thus, there was little potential for task-generated feedback that could interfere with the manipulated peer feedback (discussed below). Peer rating feedback was given after subjects completed all measures following the first task, and all peer feedback was false. No feedback was given following the second task. Instead, after completing the questionnaires and the peer ratings forms a second time, subjects were debriefed and dismissed.

Measures

1. Task and Socioemotional Behavior. Bales' (1950) interpersonal process analysis (IPA) form was used for assessing group interaction during each task. Two independent observers, blind to feedback conditions, rated each group on all 12 of Bales' categories for each task, recording evaluations on 7-point scales for each category. Individual categories were combined, according to Bales' suggestion, to form two general dimensions of interaction—task and socioemotional behavior. Ratings for these general dimensions were computed by taking the average of each observer's ratings of all 12 categories for both tasks. These were taken to be the total set of observations (24) for that rater. This was done so that any reliability coefficients computed would be based on a reasonable number of observations. A separate reliability coefficient then was computed for each group by correlating the 24 ratings made by the two observers assigned to that group. The range of reliability coefficients across the 34 groups was between .81 and .95, and the average was .92.

2. *Satisfaction*. Group members were asked to assess their satisfaction with the participation and the contribution of the other members, the group solution, and overall satisfaction with group members. Each item was rated on a 7-point scale with higher ratings indicating greater satisfaction, and the responses to the four items were averaged to form a single measure of satisfaction. The internal consistency of this measure (coefficient alpha) was computed to be .84 and .87 for the two administrations, respectively.

3. *Group Cohesiveness*. Subjects completed a 4-item cohesiveness scale similar to that used by Terborg, Castore, and DeNinno (1976). Each item was rated on a 7-point scale with the items averaged to form a single measure of cohesiveness. The internal consistency of the scale (coefficient alpha) was .85 for both administrations.

4. *Perceived Performance*. Subjects rated their perception of the group's performance on a single 7-point scale with higher ratings indicating more effective performance.

5. *Peer Ratings*. Subjects rated the overall task performance of each of the other group members, by name, using a single 7-point rating scale (1 = very low; 7 = very high). The ratings given by the subjects to peers were averaged separately for each task, and the average ratings given by a subject served as a dependent measure.

Ratings of group interaction were obtained from the two independent observers, but all other measures came from the subjects themselves. *Objective task performance* was the actual dollar value of the cargo collected by the group on its route, expressed in points.

Conditions

Groups were randomly assigned to either positive (17 groups, $n = 70$) or negative (17 groups, $n = 73$) peer rating feedback conditions. After subjects completed peer ratings for the first task, an experimenter collected them and left the room, telling the subjects that their ratings would be averaged and returned to them. While the experimenter was absent, subjects were told to complete the other parts of the questionnaire (i.e., the satisfaction, cohesiveness, and perceived performance items) and were instructed *not* to discuss the peer ratings or the questionnaires. They were told that this was to insure that each subject recorded only his or her impressions in the questionnaires. Observers were asked to watch and listen for any such discussions and to remind subjects of the instructions (using microphones from behind the one-way glass) if anyone did begin to discuss the questionnaires or ratings. No one discussed either with fellow group members.

The experimenter returned to the room and gave each subject the false average peer rating (for overall performance) in a sealed envelope. Subjects were instructed to read but not discuss the feedback and were quickly given instructions for the second task and told to begin work. The sealed envelopes did not contain the subject's true average peer ratings. Instead, all persons in positive feedback groups were informed that they had received an average rating of about 6.0 (7.0 was the highest rating). All those in negative feedback groups were informed that they had received an average rating of about 2.5 (1.0 was the lowest rating).

No feedback was given following the second task, although subjects did complete the peer ratings and the other questionnaire measures. In addition, subjects were asked to recall the average peer rating that they had received following the first task, as a form of manipulation check. All were able to recall their average rating within .1 of a point. Discussions with subjects during debriefing indicated that they did believe the feedback received.

Results

It was hypothesized that knowledge of peer ratings would affect group member interactions, perceptions, performance, and subsequent peer ratings and that the nature of these effects would depend on the sign of the peer ratings. A series of analyses therefore was conducted considering the sign of the peer rating feedback (either positive or negative) and time (after task 1, before feedback; or after task 2, following feedback) as independent variables, and the following dependent variables: task and socioemotional behavior exhibited (rated by observers), cohesiveness, satisfaction, perceived performance, actual performance (total points collected), and average peer rating given. Table 1 presents the means (and standard deviations) for all dependent variables, broken down by time and sign of peer rating feedback.

Because the various dependent variables were correlated, a multivariate analysis of covariance (MANCOVA) was conducted. It revealed a multivariate effect for the sign of peer feedback ($F=4.53$, $p<.01$). A series of univariate analyses of covariance (ANCOVA) was then conducted on time 2 ratings with time 1 ratings as covariates, following Huck and McLean (1975), after an initial test indicated that common slope could be assumed ($F<1$). The ANCOVA results indicated significant ($p<.05$, or better) peer feedback effects on perceived performance ($F=7.32$, $\omega^2=.11$), cohesiveness ($F=6.24$, $\omega^2=.10$), satisfaction ($F=10.65$, $\omega^2=.16$), average peer rating given ($F=16.50$, $\omega^2=.20$), and rated task behavior ($F=5.62$,

Table 1
Means and Standard Deviations for All Variables at Time 1 and Time 2 for Positive and Negative Feedback Groups and the Results of Several Comparisons

	Negative Feedback			*Positive Feedback*		
	Time 1	*Time 2*	*Time 1-Time 2*[a]	*Time 1*	*Time 2*	*Time 1-Time 2*[a]
Observer measures						
Socioemotional behavior	2.84 (1.08)[b]	2.56 (.56)	<1	2.75 (.86)	2.75 (.50)	<1
Task behavior	4.76 (.72)	4.52 (.50)	<1	5.20 (.75)	5.28 (.68)	<1
Perceptual measures						
Perceived performance	6.21 (.89)	5.64 (.81)	5.28**	6.24 (1.46)	6.74 (.82)	<1
Cohesiveness	5.39 (.92)	4.95 (.42)	4.18*	5.70 (.79)	5.95 (.77)	1.02
Satisfaction	5.63 (1.02)	5.09 (.94)	3.85	5.77 (1.04)	5.81 (.88)	<1
Average peer rating given	5.33 (1.40)	4.42 (1.09)	6.08**	5.64 (1.13)	6.20 (.81)	7.42**
Actual performance	39.00 (3.62)	37.50 (4.94)	2.81	40.56 (5.24)	40.94 (3.97)	<1

[a] These are the results of simple effects analyses comparing ratings at time 1 and time 2.
[b] Standard deviations are shown in parentheses.
*$p < .05$
**$p < .01$

$\omega^2 = .09$). Thus, knowledge of peer ratings did affect most of the dependent variables of interest, although rated socioemotional behavior and objective performance did not seem to be affected.

To test the exact nature of these effects over time, for subjects learning of positive and negative peer ratings, a series of simple effects analyses, comparing time 1 and time 2 means within feedback groups, was conducted. Winer (1975) suggests that this type of analysis is more appropriate than simple t-tests, given the evidence of sign of feedback × time interactions, and the tests were conducted using formulae provided in his book. As predicted, subjects learning of positive peer ratings raised scores on all perceptual measures from task 1 to task 2, collected more points on the second task, and were rated higher on task behavior for task 2. However, only one change was significant (average peer rating given: $F = 7.42$, $p < .01$). Also as predicted, subjects learning of negative peer ratings lowered scores on all perceptual measures from task 1 to task 2, collected fewer points on the second task, and were rated lower on task and socioemotional behavior for task 2. These changes were significant for perceived performance ($F = 5.28$, $p < .05$,) cohesiveness ($F = 4.18$, $p < .05$), and average peer rating given ($F = 6.08$, $p < .01$). Thus, these results support the predicted stronger effect of learning about negative peer ratings.

Discussion

The results from this study seem to raise some doubts about the use of peer ratings for feedback, but the limitations of the present study are recognized. Perhaps foremost among these is the short time perspective studied. It is suspected that performance following negative peer ratings would deteriorate over time, but there are several other possibilities. Negative ratings conceivably could motivate a worker to try even harder in order to improve the ratings received; thus performance might actually improve over time. It also is possible that, over time, group members might become accustomed to poor peer ratings and ignore them completely. A different limitation of this study arising from the short time perspective is that in existing work groups, cohesiveness and satisfaction generally have had time to develop more fully than in this study, and workers might be less susceptible to changes following negative peer ratings. One could argue, however, that learning that close and trusted peers have given negative ratings might have an even greater debilitating effect on the group. In any event, given more time together, the apparent deterioration in group-member relations might well lead to a decline in actual performance. There is a clear need for further research with a more realistic time horizon.

Other limitations to the external validity of the present study stem from the manipulation of the peer feedback. Negative peer ratings were operationalized here as a mean rating of about 2.5 on a 7-point scale, but rarely would one peer rate another so poorly. Thus, it is possible that the relatively strong effects found for negative peer feedback were due to the extreme nature of the feedback received. Nonetheless, such a reaction would indicate that subjects did believe that such low ratings were possible. Of course, in existing groups, negative ratings probably are defined more by group norms than by scale points, and what seems to be a much more positive rating could actually be viewed as quite severe by group members.

In general, even given these limitations, the results of the present study suggest the need for further research on peer ratings and peer evaluations in general. This research needs to go beyond demonstrating significant relationships between peer evaluations and some criterion measures. This study, performed in a controlled setting, found that knowledge of how one's peers have rated a person had a definite impact on group behavior (especially when those ratings were negative). This finding cannot be ignored simply because the setting was somewhat artificial. Instead, field research needs to be conducted utilizing designs that allow assessment of effects over longer periods of time so as to understand how group interactions and patterns of behavior might be affected by feedback from peers.

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Contrast Effects in Performance Evaluation and Reward Practices

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The present study investigated whether a contrast effect was operating in making judgments about and issuing rewards to engineers and scientists. It was found that the greater the proportion of unsatisfactory performing engineers, the more favorable the engineering supervisors' performance ratings and reward practices. Similar findings were not found for the scientist sample.

The supervisor's evaluation of subordinate performance is an extremely important task in organizations. These evaluations often are used to make pay, promotion, training, lay-off, and transfer decisions. Despite the crucial role of performance evaluations, there still is limited understanding of the kinds of information supervisors use in reaching performance judgments. However, it is known that supervisors do not use all available information about subordinates to make judgments (Barrett, 1958; Grey & Kipnis, 1976). Furthermore, there is evidence that often the performance evaluation data used to make judgments do not correlate with objective measures of subordinates' performance (Anderson, Roush, & McClary, 1973).

The purpose of the present field study is to examine the impact, if any, of subordinate (ratee) performance on supervisor (rater) evaluations of professional employees. Specific attention is devoted to the contrast effects involved with evaluating satisfactory performing and unsatisfactory performing subordinates. Research indicates that judgments are affected by the contrast between the stimulus to be judged and its surrounding field (Black, 1968; DiVesta, 1961; Wexley, Yukl, Kovacks, & Sanders, 1972). For example, experimental simulations of the job interview suggest that average job recruits are evaluated more favorably after the person making the evaluation has evaluated several unfavorable recruits in a row (Wexley et al., 1972).

Two industrial simulation studies shed some light on the issue of contrast effects in the performance evaluation process. Goodstadt and Kipnis (1970) and Kipnis and Vanderveer (1971) reported that the presence of unsatisfactory performing subordinates who deliberately did not respond to or obey requests of a supervisor resulted in an increased number of rewards distributed and higher performance ratings assigned by the supervisor to satisfactory performing subordinates. On the other hand, when all subordinates responded favorably to supervisory requests, few rewards and lower performance ratings were given, even to outstanding performing subordinates. These two studies indicated how the contrast effect operated in performance evaluation in simulated settings. The results of the simulations suggest that supervisor evaluations of satisfactory performing individuals are influenced by his/her judgments about unsatisfactory performing individuals.

Research (Goodstadt & Kipnis, 1970; Kipnis & Vanderveer, 1971) has indicated that only under some circumstances does a contrast effect occur. For example, when an evaluator had subordinates who deliberately appeared to resist orders and requests, satisfactory performing subordinates were evaluated more favorably. However, when a subordinate did poor work because of ineptness (lack of ability), supervisors did not evaluate more favorably or grant more rewards. Whether these findings based on industrial simulation procedures using students as evaluators and subordinates generalize to organizational settings was not known at the conclusion of the original Kipnis (1960) study.

The issue of the relative importance of unsatisfactory performance attributed to ineptness versus poor attitudes was studied by Grey and Kipnis (1976) in the home office of an insurance company. Specifically, the researchers attempted to determine if supervisors with unsatisfactory performing subordinates issued more favorable performance evaluations and granted greater pay increases to satisfactory performing subordinates. This field study of 59 supervisors suggested that a subordinate's performance evaluation and salary history may be as much a function of the behavior of co-workers as the person's (subordinate or ratee) own technical job competence or ineptness.

The 59 supervisors of clerical employees indicated the number of unsatisfactory performing workers in their group and evaluated the performance of their remaining satisfactory performing subordinates (Grey & Kipnis, 1976). It was found that the greater the proportion of unsatisfactory performing subordinates in a group, the more favorable the subjective evaluations of satisfactory performers.

Despite the importance of performance evaluation judgments and the potential impact of contrast effects, few studies have been conducted in ongoing work settings (Grey & Kipnis, 1976). Whether the findings of Grey and Kipnis (1976) can be generalized to evaluations occurring with other than clerical subordinates is not known. For example, is it safe to conclude that a contrast effect is present when professional engineers and/or scientists are evaluated by supervisors? Are rewards other than pay affected by the contrast effect phenomena when professional employees are involved?

The purpose of the present study is to determine if a contrast effect occurs for the performance evaluation of engineers and research scientists. The previous research work based largely on laboratory findings may or may not apply to other organizational settings when professional employees are being evaluated. However, based on the limited research available and knowledge about the operation of the contrast effect phenomenon, *it was predicted that the greater the proportion of unsatisfactory performing engineers and scientists perceived by supervisors conducting performance evaluations, (a) the more favorable the ratings of satisfactory performing engineers and scientists, (b) the greater the number of public and private recognition rewards given by the supervisor to satisfactory performers, and (c) the greater the magnitude of salary increases recommended and actually granted to satisfactory performing engineers and scientists.*

Method

The study was conducted in the engineering and research and development divisions of a large international company located in the Midwest. Participants included 104 supervisors of engineers working on teams. These supervisors directed a total of 624 engineers, ranging in age from 22 to 61. There were 89 male and 15 female supervisors who directed teams of engineers, technicians, and draftspeople of varying size, ranging from 9 to 44 subordinates (median = 11.8).

The second set included 66 supervisors of scientists with physics, chemistry, and mathematical backgrounds working primarily on research projects. These supervisors directed a total of 404 scientists, ranging in age from 25 to 65. There were 54 male and 12 female supervisors who directed units of varying size, ranging from 4 to 17 subordinates (median = 9.8).

Each supervisor had an appointment to discuss performance evaluations with a representative of the firm's executive research task force. At these meetings the supervisors were given a set of forms for evaluating each of their subordinates. They were informed that the completion of the forms was a part of the task force's program to identify (1) training needs, (2) procedural problems, and (3) issues for further research. They also were told that although the present project was exploratory, it would be used as a part of the firm's performance appraisal program. In other words, the project was real and not a simulation or a practice.

Evaluation Forms for Subordinates

The evaluation forms given to each supervisor had the name of a subordinate printed at the top. These forms were used regularly as part of the organization's performance evaluation. It should be noted that the supervisors were instructed not to provide forced distributed evaluations. A separate form was completed for each of the supervisor's subordinates. The forms contained the following sections:

A. Performance: Engineers. Seven areas of engineer performance were evaluated. The seven factors were (1) technical competence, (2) self-sufficiency, (3) relationships with others, (4) communication competence, (5) initiative, (6) administrative competence, and (7) overall engineering performance. The supervisor evaluated each subordinate on the seven factors using a 6-point scale anchored at equal appearing intervals ranging from 1 (below acceptable) to 6 (significantly above acceptable). Because of the moderately high intercorrelations among the engineering performance factors, the evaluations were summed. The coefficient alpha reliability of the combined measure was .86. A good evaluation was indicated by a high score.

B. Performance: Scientists. Four areas of performance for scientists were rated. The four factors were (1) creativity, (2) contributions made, (3) team effort, and (4) overall performance. The supervisor evaluated each subordinate on the four factors using a 7-point scale anchored at equal appearing intervals ranging from 1 (unsatisfactory) to 7 (exceptional). Again, because of the moderately high intercorrelation among the four factors, supervisory ratings were summed to yield a scientist performance rating. The coefficient alpha reliability of the combined measure was .82. The higher the score, the more favorable the rating.

C. Public and Private Recognition. Supervisors were asked to indicate how frequently they publicly (announced to others) and privately (told only the person) recognized good performance of subordinates. They answered two questions: "How frequently do you publicly recognize the good performance of ______________?" and "How frequently do you privately recognize the good performance of ______________?" Responses were recorded on a 5-point scale anchored from 1 (never) to 5 (at least once a day).

D. Promotion Potential. Supervisors were asked to: "Estimate the promotion potential of ______________." Responses were recorded on a 9-point scale labeled "chances in 100 of being promoted." The range was from 10 or less to 90 or greater.

E. Recommended Merit Increase. Supervisors were asked to indicate the size of merit increase they would recommend for each subordinate. The question was: "What percent merit increase would you recommend for ______________ if the budget permitted any increase that you could give?" Responses ranged from an annual increment of 0 to 24 percent or more, in intervals of 2 percent.

F. Actual Merit Increase Granted (Percent). The actual merit pay increase for subordinates who were working for the supervisor over the last one year period were determined. The actual merit increases are what the subordinates received the last time they were given a pay increase. The supervisors' recommendations for merit increase were considered an important input in this reward decision. Of course, budgeting and government constraints had to be considered in granting any merit increases to engineers and scientists.

Satisfactory and Unsatisfactory Performers

The Grey and Kipnis (1976) study presented a procedure for separating subordinates into satisfactory and unsatisfactory performance groups. A similar procedure was used in the present study. Each supervisor was asked: "Does ______________ have any problems performing the requirements of his/her job? If there is a performance problem, it is due to (1) lack of ability, (2) poor attitude, (3) both lack of ability and poor attitudes, or (4) subordinate has no identifiable performance deficiency."

The proportion of supervisor perceived unsatisfactory performance was then calculated as follows. The proportion of inept subordinates of a supervisor was determined by the number of individuals who were rated as lacking in ability. This number was then divided by the supervisor's span of control. Similarly, the proportion of poor attitude subordinates and combined problems (a lack of ability and poor attitudes) was calculated. Supervisors of scientists reported that about 21 percent of their subordinates were not performing well because of attitude and/or ability problems. Three supervisors reported the highest unsatisfactory performers. They considered that 65 percent of their subordinates were unsatisfactory. However, 14 supervisors indicated that none of their subordinates had performance deficiencies.

The engineering supervisors reported that about 27 percent of their subordinates had performance deficiencies caused by a lack of ability and/or poor attitudes. The range of reported deficiencies was from 72 percent (one supervisor) to 0 percent (ten supervisors).

The scoring method enabled the researcher to classify subordinates of each supervisor as satisfactory or unsatisfactory. The satisfactory performing engineers and scientists were those who were rated as having no identifiable ability or attitude performance deficiencies.

Results

In order to control or remove the effects of possible contaminants from the relationships between predictors and criteria, a number of variables were examined. The personnel files of each supervisor and subordinate were culled to extract the following: (1) tenure of supervisor with present team, (2) tenure of supervisor in the organization, (3) tenure of satisfactory performing subordinates with present team, (4) tenure of satisfactory performing subordinates with organization, (5) tenure of all subordinates with present team, (6) average age of satisfactory performing subordinates, (7) average formal education of satisfactory performing subordinates, (8) sex of supervisor, (9) age of supervisor, and (10) race of supervisor.

The correlation between the total number of subordinates reporting to a supervisor (span of control) and the proportion of employees classified as inept, possessing poor attitudes, or having combined problems did not differ significantly from zero for the scientists or engineers. Also, the span of control did not correlate significantly with any of the dependent variables for scientists (*r*s of .05 to .09) or engineers (*r*s of .02 to –.04). Thus, it was concluded that span of control did not have to be included as a possible contaminant.

The supervisors' judgments concerning satisfactory performing subordinates were the main focus of the present study. Thus, measures of performance ratings, public and private recognition, promotion potential, recommended merit increases, and actual merit increases were assessed, using the satisfactory performing subordinates as the basis of calculating scores. Individual scores for each dependent variable were summed for all satisfactory performing subordinates and divided by the number of satisfactory performing subordinates in each supervisor's team. The resultant measures were the mean values of the ratings assigned by each supervisor. The means, standard deviations, and intercorrelations of all independent and dependent variables are presented in Table 1 for the engineers and scientists.

Table 1
Means, Standard Deviations, and Correlations Between the Proportion of Unsatisfactory Performing Subordinates on a Team and Supervisor Evaluations of Satisfactory Performing Subordinates[a]

Variables	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Independent											
1. % Lack of	.10	.21	—								
technical ability	(.08)	(.19)	—								
2. % Poor attitudes	.11	.18	–.20	—							
	(.10)	(.16)	(.23)	—							
3. % Combined	.06	.10	.28	–.29	—						
problems	(.03)	(.09)	(.33)	(.27)	—						
Dependent											
4. Performance	28.1	5.8	.37	.40	.07	—					
ratings	(20.8)	(4.9)	(.14)	(.13)	(–.07)	—					
5. Public recognition	2.4	2.0	.07	.27	–.08	.27	—				
	(2.8)	(2.9)	(.08)	(–.04)	(–.09)	(.28)	—				
6. Private	2.7	1.0	.32	.34	.14	.22	.24	—			
recognition	(3.2)	(2.4)	(–.13)	(.29)	(.11)	(.24)	(.31)	—			
7. Promotion	58.4	17.6	.07	.28	.10	.42	.38	.27	—		
potential	(63.7)	(20.2)	(.07)	(.14)	(.04)	(.07)	(.20)	(.16)	—		
8. Recommended	16.2	6.4	.33	.29	.07	.60	.40	.29	.47	—	
merit increase	(14.7)	(5.8)	(.05)	(.09)	(.00)	(.29)	(.24)	(–.05)	(.36)	—	
9. Actual % merit	10.8	4.3	.02	.26	–.05	.24	.31	.21	.36	.09	—
increase	(9.2)	(3.6)	(.08)	(–.06)	(.07)	(.16)	(.10)	(.07)	(.27)	(.15)	—

[a] $N = 104$ engineering supervisors; $N = 66$ scientist supervisors. Upper data pertain to engineers. Data in parentheses are for scientists. For engineers, $r \geq .24, p < .01$, and $r \geq .15, p < .05$. For scientists, $r \geq .28$, $p < .01$, and $r \geq .19$, $p < .05$.

Lack of Ability

Table 1 reveals that the proportion of engineers perceived to have a lack of ability correlated with the performance evaluations, private recognition received by engineers, and recommended merit increases. The greater the proportion of inept engineers in a work team, the higher the supervisor's performance ratings, the more private recognition for performance given, and the higher the percentage of recommended merit increases given to satisfactory performing engineers.

In the scientist portion of Table 1, note that only weak correlations are displayed for the ability variable and the six dependent variables. That is, lack of ability did not predict any of the dependent variables of satisfactory performing scientist subordinates at a statistically significant level.

Subordinates with Poor Attitudes

The proportion of engineers perceived as having poor attitudes correlated .40 with performance ratings, .34 with private recognition, and .29 with recommended pay raises. In fact, poor attitudes correlated with each of six dependent variables at a statistically significant level ($p < .01$). These findings support the prediction that the greater the proportion of subordinates manifesting poor attitudes, the more favorable the consequences for satisfactory performing subordinates (i.e., ratings, merit increases).

The scientist portion of Table 1 presents a different picture from that of the engineer portion. Only the correlation between poor attitudes and private recognition was statistically significant for the scientist sample. That is, the greater the proportion of subordinates manifesting poor attitudes, the more public recognition satisfactory performing subordinates received. For the other five correlations there is no support for the contrast effect phenomena.

Combined Problems: Ineptness and Attitudes

The measure of combined problems was determined by finding the proportion of subordinates who were viewed by their supervisors as lacking technical ability and also displaying poor attitudes. Table 1 indicates that the proportion of combined problems was not significantly correlated with any of the six dependent variables. It should be noted, however, that very few supervisors reported having subordinates who displayed combined problems (only 10 of 104 engineering supervisors and 8 of 66 scientist supervisors). Thus, this variable had the least variability of any of the independent variables. Apparently the lack of variability inhibited the combined problems' predictability.

In order to examine more closely the independent variables' predictive power, multiple regression analysis was used with the engineer and scientist data. The results of the multiple regression analyses are presented in Table 2 (engineers) and Table 3 (scientists). The Table 2 data show that the combination of the three forms of unsatisfactory performance accounted for significant amounts of variance in the engineering supervisory evaluations of satisfactory performing engineers for performance ratings (35 percent), private recognition (37 percent), and recommended merit pay increase (38 percent).

Table 2
Multiple Correlations Between the Proportions of Unsatisfactory Performing Engineers in a Team and Supervisor Evaluations of Satisfactory Performing Engineers[a]

Independent Variables	Dependent Variables											
	Performance Ratings		*Public Recognition*		*Private Recognition*		*Promotion Potential*		*Recommended Pay Increase*		*Actual % Merit Increase*	
	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2
% Lack of technical ability	.37* (.34)	.14 (.12)	.07 (.03)	.00 (.00)	.32** (.30)	.10 (.08)	.07 (.05)	.00 (.00)	.33** (.31)	.11 (.09)	.02 (.00)	.00 (.00)
% Poor attitudes	.46* (.44)	.21 (.19)	.13 (.11)	.02 (.00)	.49* (.46)	.24 (.21)	.10 (.08)	.01 (.00)	.49* (.46)	.24 (.22)	.03 (.01)	.00 (.00)
% Combined problems	.59* (.56)	.35 (.32)	.19 (.17)	.04 (.01)	.61* (.58)	.37 (.35)	.11 (.09)	.01 (.00)	.62* (.60)	.38* (.35)	.03 (.01)	.00 (.00)

[a]The values in parentheses have been corrected for shrinkage $(\hat{R}^2 = 1-(1-R^2)\frac{N-1}{N-k})$.
*$p < .01$
**$p < .05$

Table 3
Multiple Correlations Between the Proportions of Unsatisfactory Performing Scientists in a Team and Supervisor Evaluations of Satisfactory Performing Scientists[a]

Independent Variables	Dependent Variables											
	Performance Ratings		*Public Recognition*		*Private Recognition*		*Promotion Potential*		*Recommended Pay Increase*		*Actual % Merit Increase*	
	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2
% Lack of technical ability	.14 (.11)	.02 (.00)	.08 (.06)	.00 (.00)	−.13 (−.11)	.01 (.00)	.07 (.05)	.00 (.00)	.05 (.03)	.00 (.00)	.08 (.06)	.00 (.00)
% Poor attitudes	.22* (.20)	.05 (.03)	.10 (.08)	.00 (.00)	−.10 (−.08)	.01 (.00)	.10 (.08)	.00 (.00)	.07 (.05)	.00 (.00)	.12 (.10)	.01 (.00)
% Combined problems	.26* (.24)	.07 (.05)	.12 (.10)	.01 (.00)	−.09 (−.06)	.00 (.00)	.13 (.11)	.02 (.00)	.07 (.04)	.00 (.00)	.16 (.13)	.03 (.01)

[a]The values in parentheses have been corrected for shrinkage $(\hat{R}^2 = 1-(1-R^2)\frac{N-1}{N-k})$.
*$p < .05$

The combination of the various forms of unsatisfactory performance accounted for very little variance in the supervisory evaluations of satisfactory performing scientists. Table 3 shows that the largest amount of variance accounted for in the evaluations of satisfactory performing scientists was for the performance ratings (7 percent).

Partial Correlations

The correlational analysis indicated that the proportion of subordinates in both the engineer and scientist samples classified as lacking in ability was significantly correlated with a number of possible contaminants (e.g., tenure of satisfactory performing subordinates with present team, tenure of satisfactory performing subordinates with organization). Similar correlations were found for the engineers' lack of technical ability and the performance ratings, private recognition, promotion potential, and recommended merit increase. In order to remove the effects of contaminants from the relationships between independent and dependent variables, partial correlations were computed. In doing so, all contaminants significantly correlated with either the independent or dependent variables were held constant.

Table 4
Partial and First-Order Correlations Between the Proportion of Unsatisfactory Performing Engineers and Evaluations of Satisfactory Performing Engineers[a]

	Performance Ratings		*Public Recognition*		*Private Recognition*		*Promotion Potential*		*Recommended Pay Increase*		*Actual Merit Increase*	
Independent Variables	*r*	*Partial r*	*r*	*Partial r*	*r*	*Partial r*	*r*	*Partial r*	*r*	*Partial r*	*r*	*Partial r*
% Lack of technical ability	.37	.27	.07	.03	.32	.25	.07	.01	.33	.31	.02	−.01
% Poor attitudes	.40	.29	.27	.20	.34	.29	.28	.20	.29	.24	.26	.21
% Combined problems	.07	.08	−.08	−.07	.14	.06	.10	.10	.07	.01	−.05	−.02

[a] $r \geq .24$, $p < .01$; $r \geq .15$, $p < .05$. Possible contaminants controlled for include: (1) tenure of supervisor with present team; (2) tenure of supervisor in organization; (3) tenure of compliant subordinates with present team; (4) tenure of compliant subordinates with organization; (5) tenure of all subordinates with present team; (6) average age of compliant subordinates; (7) average formal education of compliant subordinates; (8) sex of supervisor; (9) age of supervisor; and (10) race of supervisor.

Table 4 presents the partial correlation data for the engineer sample. As presented, the first-order and partial correlations are similar. This suggests that the first-order correlations were not spurious. The same partial correlational analysis was performed on the scientist data. However, few differences in the first-order and partial correlations were found.

Discussion

The results of the present study provide some support for the presence of a contrast effect in evaluating the performance of engineers. However, no such effect was identified when the scientist data were analyzed. The contrast effect was such that the more pervasive the unsatisfactory performance, the more favorable was the engineering supervisors' judgments, recognition, and monetary recommendations for satisfactory performing engineers. This finding generally supports those of the Grey and Kipnis (1976) study. That is, satisfactory performers are the beneficiaries of higher performance ratings and more rewards when unsatisfactory performers are part of the supervisor's work team. On the other hand, the scientist data analysis revealed no contrast effect. Thus, the pervasiveness of a contrast effect in the evaluations of satisfactory and unsatisfactory performing employee groups must be cautiously considered on a case by case basis.

An analysis of the three types of unsatisfactory performance indicated that in the engineer sample the poor attitudes displayed by subordinates had the most pronounced effect on supervisor evaluations and rewards provided to satisfactory performing engineers. Poor attitudes had the single highest correlation with five of the six dependent variables in the engineer sample. Again, this result corresponds to that in earlier laboratory studies (Goodstadt & Kipnis, 1970; Kipnis & Vanderveer, 1971) and the one field study (Grey & Kipnis, 1976).

The results of the present study indicate that, at least for the engineers, the proportion of inept subordinates influenced the supervisor's performance ratings, private recognition, and merit pay recommendations applied to satisfactory performing engineers. In fact, ineptness was almost as important as the proportion of poor attitudes of subordinate engineers in affecting supervisory judgments and reward practices. In the field of engineering, competence is an extremely important dimension (Badawy, 1971; South, 1980). Thus, ineptness may be viewed by supervisors to be as crucial as poor attitudes in maintaining and encouraging performance standards.

The contrast effect was not found with the scientist sample. This raises the issue of similarities and differences in goals, attitudes, and skill requirements of engineers and scientists. In the career literature engineers and scientists are referred to as professionals (Abrahamson, 1967; Greene, 1978; Harlow, 1973; Misshauk, 1970). However, some researchers suggest that engineers and scientists differ considerably along many personal, career, and job requirement dimensions (Badawy, 1971; Kerr, Von Glinow, & Schriesheim, 1977).

The differences in work goals, needs, professional orientation, and job attitudes of engineers and scientists may be the reason that no contrast effect was found in the analysis of the scientist data. Scientists generally bring to their work an internalized set of performance standards for scientific activity. Based on previous research data, it appears that scientists value respect of colleagues, freedom to work without supervision, and professional affiliations outside the firm more than do engineers (Badawy, 1971; Kerr et al., 1977; Strauss, 1963). In other words, the scientist derives a significant portion of his or her rewards from being a professional scientist instead of from working for a particular organization.

On the other hand, engineers may value such rewards as recognition and merit increases received from the employer through the performance appraisal system. Consequently, the formal performance appraisal system probably would have more relevance for engineers. If this is the case, then engineering supervisors may assume that their role as evaluators is important and meaningful. However, the supervisors of scientists may assume that because scientists derive valued intrinsic rewards from the profession, the performance evaluations and rewards they can provide, such as recognition and ratings, are not very important. This suggests that the contrast effect in evaluating subordinates may not be an important consideration of the scientists' supervisors. They go through the motions of performance appraisal and are not influenced by the proportion of unsatisfactory performing scientists. After all, their ratings and rewards practices are not that significant to their subordinates.

Of course the present study was not designed to examine the value systems or the importance of performance appraisal and reward practices to scientists and engineers. Thus, the accuracy of the explanation of the differences in the power of the contrast effect between engineers and scientists should be examined in future research investigations.

In summary, in the present study the operation of a contrast effect accounted for differences in the evaluation of and distribution of rewards to satisfactory and unsatisfactory performing engineers. It seems worthwhile to investigate other samples of engineers and scientists, as well as other professionals such as accountants, teachers, and computer scientists, to determine whether the contrast effect is an important issue in performance evaluations and reward distribution.

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Effects of Task and Personality Characteristics on Subordinate Responses to Participative Decision Making[1]

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The effects of task and personality characteristics on subordinate responses to participatory decision making were investigated among 229 supervisor-subordinate pairs. Contrary to prediction, high need-for-independence subordinates performed better and were more satisfied with high participation only for nonrepetitive tasks.

Early investigations of the effects of participative decision making (PDM) have focused on subordinate personality characteristics (primarily, need for independence or autonomy and authoritarianism) as potential moderators of the PDM-subordinate response relationships (Abdel-Halim & Rowland, 1976a; Vroom, 1960). PDM was hypothesized to have a more positive effect on the job satisfaction and performance of subordinates with strong rather than weak independence needs and with low rather than high predisposition toward authoritariansim. Although support for this hypothesis was reported in studies by Mitchell, Smyser, and Weed (1975), Runyon (1973), and Vroom (1960), lack of support was reported in studies by Abdel-Halim and Rowland (1976a), Sadler (1970), and Tosi (1970). In light of these inconsistent findings, Schuler (1976) used the path-goal theory of leadership effectiveness (House & Mitchell, 1974) to provide a basis for reconciling the above conflicting findings. The path-goal theory suggests that "the *task* may have an overriding effect on the relationship between...participation and subordinate responses, and that individual predispositions or personality characteristics of subordinates may have an effect only under some tasks" (House & Mitchell, 1974, p. 93).

The assumption behind the path-goal theory predictions is that PDM would have a strong positive impact on subordinate work motivation and satisfaction when it is perceived as *instrumental* in clarifying task goals or paths to achieve these goals. Accordingly, House and Mitchell make the following predictions:

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[1] The author wishes to thank Randall Schuler and two anonymous reviewers for their helpful comments on an earlier draft of this article.

> When. . . task demands are ambiguous (or non-repetitive), participative leadership will have a positive effect on the satisfaction and motivation of the subordinates, *regardless* of the subordinate's predisposition toward. . . authoritarianism or need for independence. When task demands are clear (or repetitive), *subordinates who are not authoritarian and who have high needs for independence*. . . will respond favorably to leader participation and their opposite personality types will respond less favorably (1974, p. 93; emphasis added).

The path-goal theory thus suggests that *both* task and personality characteristics of subordinates *interact* to determine the effects of PDM on the job satisfaction and performance of subordinates. The path-goal theory, as well as several previous studies (Abdel-Halim & Rowland, 1976a; Tosi, 1970; Vroom, 1960), also assumes that subordinates with strong independence or autonomy needs will respond to PDM in a way similar to nonauthoritarian subordinates. That is, in regard to PDM, need for independence is considered as an inverse characteristic of authoritarianism. Whether or not this assumption is true remains to be established.

Only one study, by Schuler (1976), attempted to examine the above path-goal theory predictions using job satisfaction data from a sample of 353 managerial and nonmanagerial employees of a large manufacturing organization. The results indicated that subordinates' PDM was satisfying to low authoritarian subordinates *regardless* of the degree of task repetitiveness, but it was satisfying to high-authoritarian subordinates *only* on tasks with low repetitiveness. Considering the question of external validity, there is a need to examine the path-goal theory predictions using other personality variables. Need for independence or autonomy is a personality characteristic that is specified by the path-goal theory as well as previous studies as an important variable that should moderate the PDM-subordinate response relationship (House & Mitchell, 1974). (Also see the review by Abdel-Halim and Rowland, 1976a.)

This study is an attempt to extend the validity of the path-goal theory predictions (House & Mitchell, 1974) and previous research findings (Schuler, 1976) by examining the manner in which subordinate need for independence or autonomy and task repetitiveness interact to determine subordinate responses to PDM. The path-goal hypothesis predicts that *subordinate PDM, need for independence, and task repetitiveness will interact such that high PDM will be satisfying and effective (in terms of job performance) for high need-for-independence subordinates regardless of the degree of task repetitiveness, but it will be satisfying and effective for low need-for-independence subordinates only on tasks with little repetitiveness.*

Method

Sample

Data were collected from a sample of 229 supervisory and nonsupervisory employees in a large, retail-drug company in the Midwest. The various research instruments were included in a questionnaire that was administered to respondents during working hours by the researcher. The sample included 185 males and 44 females; 95 percent of all respondents had at least a high school diploma and 48 percent had at least a college degree. The average age of the respondents was about 30 years, and average company tenure was three years.

Measures

Means, standard deviations, scale characteristics, internal consistency reliabilities, and intercorrelations among all variables are presented in Table 1.

Table 1
Scale Characteristics, Means, Standard Deviations, Internal Consistency and Intercorrelations Among All Variables[a]
($N=229$)

Scale	*Number of Items*	*Possible Range*	*Mean*	*S.D.*	*Correlations Among Variables* 1	2	3	4	5
1. Participative decision making	9	9-54	31.87	13.33	(.93)				
2. Need for independence	6	6-30	17.74	2.98	-.01	(.65)			
3. Task repetitiveness	5	5-25	11.16	3.87	-.44	.16	(.80)		
4. Job satisfaction	18	0-54	39.10	8.98	.37	-.17	-.41	(.80)	
5. Job performance	5	5-25	19.10	3.68	.26	-.14	-.18	.24	(.91)

[a] Correlation coefficients of .16 and .20 are significant at $p<.05$ and .01, respectively. Numbers in parentheses refer to the internal consistency reliabilities obtained by applying the Spearman-Brown prophecy formula to the mean interitem correlation.

Participative Decision Making. A 9-item index taken from Abdel-Halim and Rowland (1976b) was used to measure subordinates' perceived PDM. The items emphasized subordinates' overall influence on their superior's decisions that affect their work as well as the frequency of their participation in personnel, budgetary, procedural, and policy decisions with their immediate supervisors. Responses were made on a 6-point scale.

Need for Independence. Subordinates' need for independence or autonomy was measured by six items taken from the short form of a need for independence index developed by Vroom (1960). The items tapped subordinates' "predisposition to strive for self-reliance, to do things alone without help" (Vroom, 1960, p. 16). Responses were made by checking the most appropriate answer on a 5-point scale. Vroom (1960) reported a test-retest reliability of .61 for this measure.

Task Repetitiveness. A 5-item index taken from a measure developed by Hage and Aiken (1969) was used to measure the degree of task repetitiveness. The measure emphasized how much variety or routineness there was in the work. Responses were made on a 5-point, true-false scale.

Job Satisfaction. The path-goal theory suggests that PDM is expected to facilitate task accomplishment, resulting in employee satisfaction with the work itself. Consistent with Schuler (1976), subordinates' satisfaction with their work was measured by the 18-item satisfaction with work itself scale of the Job Descriptive Index (JDI) developed and validated by Smith, Kendall, and Hulin (1969).

Job Performance. Each respondent was rated by his/her immediate supervisor with respect to the following five items taken from Porter and Lawler (1968): quality of work performance, productivity on the job, amount of effort expended on the job, speed on the job, and overall work performance. Ratings were made on a 5-point scale. In all the above measures, a score was obtained for each respondent by summing his/her responses or ratings across all items in the measure.

Analysis

Following Schuler (1976), the 229 respondents were dichotomized at the median into high and low groups on PDM, need for independence, and task repetitiveness in a 2×2×2 analysis of variance (ANOVA) design. Because categorization of respondents into the eight cells of the design created unequal sample sizes, an unweighted means analysis was employed to maintain the orthogonality of the independent variables (Winer, 1971). Two repeated runs of ANOVA were completed, one for each dependent variable (i.e., job satisfaction and job performance). Scheffé tests (Winer, 1971) were performed to determine significant differences in the means of the appropriate subgroups.

Results

The ANOVA summary is shown in Table 2. The results indicate significant main effects on job satisfaction ($F = 8.84$, $p < .001$; eta = .32) and job performance ($F = 12.50$, $p < .001$; eta = .26) for PDM and on job satisfaction

Table 2
Three-Way Analysis of Variance Among Participative Decision Making, Need for Independence, and Task Repetitiveness with Job Satisfaction and Performance

		Job Satisfaction		*Job Performance*	
Sources of Variation	*DF*	*SS*	*F*	*SS*	*F*
Main effects:					
Participative decision making (PDM)	1	523.11	8.84**	153.35	12.30**
Need for independence (NI)	1	101.66	1.72	12.38	<1
Task repetitiveness (TR)	1	2286.97	38.67**	5.40	<1
Interaction effects:					
PDM×NI	1	116.80	1.97	6.43	<1
PDM×TR	1	344.20	5.82**	1.64	<1
NI×TR	1	29.18	<1	5.35	<1
PDM×NI×TR	1	231.93	3.92*	50.16	4.02*
Residual	221	13068.73		2758.77	

*$p < .05$
**$p < .01$

Table 3

Job Satisfaction and Job Performance Means for the Main Effects of Participative Decision Making, Need for Independence, and Task Repetitiveness and Their Significant Three-Way Interactions[a]

Variable	*Job Satisfaction Means*	*Job Performance Means*	*Variable*	*Job Satisfaction Means*	*Job Performance Means*
Low PDM	36.41	18.20	High PDM	42.17	20.07
Low NI	40.06	19.33	High NI	38.36	18.90
Low TR	43.08	19.61	High TR	34.92	18.59
Significant 3-way interactions					
High NI, Low PDM, Low TR	38.75	17.25	Low NI, Low PDM, Low TR	45.25	19.04
High NI, Low PDM, High TR	32.60	17.85	Low NI, Low PDM, High TR	33.36	18.36
High NI, High PDM, Low TR	43.65[b]	20.71[b]	Low NI, High PDM, Low TR	43.00[c]	19.89[c]
High NI, High PDM, High TR	38.22[b]	18.77[b]	Low NI, High PDM, High TR	40.64[c]	20.78[c]

[a] PDM = Participative decision making; NI = Need for independence; TR = Task repetitiveness.
[b] Scheffé test of mean differences significant at $p < .05$.
[c] Scheffé test of mean differences not significant.

for task repetitiveness ($F=38.67$, $p<.001$; eta $=.46$). The data in Table 3 show that under high PDM, subordinates were more satisfied ($\bar{X}=42.17$) than under low PDM ($\bar{X}=36.41$). Similarly, subordinates were rated higher on job performance under the former than the latter PDM condition ($\bar{X}=20.07$ vs. $\bar{X}=18.20$). Further, subordinates working on tasks with low repetitiveness were more satisfied ($\bar{X}=43.08$) than were those on highly repetitive tasks ($\bar{X}=34.92$). PDM and task repetitiveness had a significant two-way interaction ($F=5.82$, $p<.01$; eta $=.16$). Analysis of subgroup means, not shown, indicates that PDM was significantly more satisfying for subordinates working on tasks with low than with high repetitiveness. These results are consistent with Schuler's (1976) and previous research findings.

The results in Table 2 further indicate that, as predicted, subordinate PDM, need for independence, and task repetitiveness had a significant three-way interaction on job satisfaction ($F=3.92$, $p<.05$; eta $=.13$) and job performance ($F=4.02$, $p<.05$; eta $=.13$). Subgroup means, shown in Table 3, indicate that high PDM was satisfying to low need-for-independence subordinates regardless of the degree of task repetitiveness ($\bar{X}=43.00$ for low task repetitiveness vs. $\bar{X}=40.64$ for high task repetitiveness, and that difference was not significant). High PDM was satisfying, however, to high need-for-independence subordinates only on low task repetitiveness ($\bar{X}=43.36$ vs. $\bar{X}=38.22$ for low and high task repetitiveness, respectively, and that difference was significant at $p<.05$). Similar results were obtained for job performance. Under high PDM, subordinates with low and high need-for-independence predispositions were rated by their supervisors as being effective regardless of the degree of task repetitiveness ($\bar{X}=19.89$ vs. $\bar{X}=20.78$ for low and high task repetitiveness, respectively, and that difference was not significant). High need-for-independence subordinates were rated significantly higher on job performance under high PDM only when tasks were low on repetitiveness ($\bar{X}=20.71$ vs. $\bar{X}=18.77$ for low and high task repetitiveness, respectively, and that difference was significant at $p<.05$). These results are contrary to the predictions made by the path-goal hypothesis.

Discussion

The results of this study are consistent with previous research findings (Schuler, 1976) suggesting that the degree of task repetitiveness has a significant effect on the manner in which different need-for-independence or authoritarianism subordinates respond to PDM. Some of the results agree with the path-goal theory prediction indicating that when tasks are nonrepetitive, PDM will have a positive effect on job satisfaction and performance *regardless* of the subordinate's predisposition toward independence or autonomy. A question arises, however, regarding the manner in which different need-for-independence subordinates respond to PDM under highly repetitive or routine task conditions. The results indicate that *high* need-for-independence subordinates show significant differential responses (in terms of job satisfaction and performance) to PDM under different degrees of task repetitiveness, but the path-goal theory (House & Mitchell, 1974) predicts that *low* need-for-independence subordinates are the ones who should exhibit such a pattern of responses.

A partial explanation of these inconsistent findings may be found in the manner in which different need-for-independence subordinates relate to PDM. The path-goal theory suggests that when the task is highly repetitive or routine and subordinates are not allowed to make their own work decisions, participation with supervisors would have little, if any, instrumental value because it would not be required for effective task performance. PDM would still serve, however, the needs of the high need-for-independence subordinates to share in the controlling and decision making processes with superiors (House & Mitchell, 1974). Thus, the path-goal theory assumes that PDM is consistent with, and gratifying for, the independence of autonomy needs of the subordinates. The present findings, however, indicate that this is not necessarily true.

Previous research (Kasl, Sampson, & French, 1964; Steers, 1977) suggests that subordinate need for independence or autonomy may be inversely related to PDM. Steers argues, for example, that "subjects high in need for autonomy would be adverse to PDM because of their desire to act independently and without constraints" (1977, pp. 839-840). Similarly, Vroom's definition of need for independence emphasizes subordinates' predisposition "to do things *alone without help*" (1960, p. 16; emphasis added). According to this alternative view, when *high* need-for-independence subordinates work on highly repetitive, routine tasks, they might consider supervisory requests for their opinions (or participation) in decision making as interferences that might further limit their freedom to act independently in their own work environment. Additionally, PDM usually is associated with the subordinate's commitment to the decisions made and consequently might be perceived as too constraining, especially if it does not have high instrumental value.

Abdel-Halim and Rowland (1976a) also suggest that high need-for-independence subordinates might be interested more in maintaining their autonomy on the job than in seeking shared influence with their immediate supervisors. This is particularly true if PDM involves relatively broad decisions that are related to the work situation (as in the present study) but do not alter the routine, structured nature of the task (Gardell, 1977). In this case, high PDM would be dissatisfying and ineffective for high need-for-independence subordinates working on highly repetitive, routine tasks. Under the same PDM and task conditions, on the other hand, *low* need-for-independence subordinates, knowing that the outcomes of their participatory behavior with supervisors are practically inconsequential to their task performance, probably would consider PDM as an opportunity to satisfy other manifest needs (Steers, 1977), such as social and support needs.

Should the present findings stand up under replication, this would call for the modification of the path-goal theory. Schriesheim and Von Glinow indicate that previous research findings suggest that "the theory itself is deficient, producing inconsistent results" (1977, p. 404). Thus, refinement of the path-goal theory may indeed be in order.

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Sex and Position as Predictors of Organizational Commitment

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The present study empirically examines sex and position as predictors of organizational commitment for 583 employees of social service organizations. The results of simple correlational and multiple hierarchical regression analyses found that, contrary to previous research, neither sex nor position was a critical determinant of organizational commitment.

It currently is in vogue to argue that sex differences are important and pervasive in work organizations and that managers should develop *different* programs or strategies for dealing with women—if they intend to use female workers to their fullest capacity. What writers generally fail to point out, however, is that although such recommendations may be commendable when true sex differences in attitudes or behavior exist, in the *absence* of sex differences the conduct of special programs for women may actually facilitate sexism or lead to perceived sex differences where none had existed. That is, management practices based on assumed differences between men and women may actually help to create such differences through self-fulfilling prophecy or may magnify differences that otherwise would not have had serious detrimental consequences.

A classic case in point is the recent paper by Bhagat and Chassie (1981), which purported to assess the determinants of organizational commitment in working women. Although these researchers introduced no evidence whatsoever of sex differences in commitment, they argued that an investigation of the "nature of commitment processes among working women *per se*" was needed and chose to investigate these processes for a small sample of women *only*. The clear implication of this paper is that women need to be treated differently than men if commitment is the goal.

This situation is exactly analogous to another, but more fully developed, potential sex differences problem that involves work-related competence. Throughout the late 1970s many writers (Barnett & Baruch, 1978; Hanlan, 1977; O'Leary, 1974) speculated—on the basis of data from laboratory research—that women have less positive self-referent attitudes than do men and that organizations should develop special training programs and different career ladders and so on for women in order to prevent the undesirable outcomes (such as poor performance or absenteeism) that have been associated with low self-evaluations. However, the first relevant studies of employed persons in actual work settings (Bruning & Snyder, 1981; Snyder & Bruning, 1979) showed that *position* characteristics, not sex, appeared to be a primary determinant of an individual's work-related sense of competence. The authors did *not* conclude that sex differences in perceived competence do not exist. Rather, they argued that managers should validate assumptions about sex differences *within* a given organization or unit before taking actions based on them, lest the assumptions become self-fulfilling.

The purpose of the present study is to extend the reasoning of Snyder and Bruning to the issue of potential sex differences in organizational commitment. Rather than assuming that such differences invariably exist, this study empirically examines the extent of sex differences, and position differences, in commitment for a large and heterogeneous sample of actually employed men and women.

Method

Subjects

The subjects were 583 employees of federally funded social service organizations in 23 states. These subjects were asked to complete an anonymous questionnaire designed to assess the effects of training programs in which their supervisors were scheduled to participate. The participants represented a variety of job types including administrators, service personnel, computer operations personnel, clerical workers, accounting personnel, and personnel management specialists. In all, more than 200 specific job titles were included. Job types, program areas, and hierarchical levels sampled were roughly proportional to their occurrence in the various organizations in which the subjects were employed. The sample was 57 percent female. Of the male subjects, 77 percent, and of the female subjects, 51 percent occupied supervisory positions.

Measures

In addition to demographic questions, the questionnaires assessed the following variables:

Organizational Commitment. Organizational commitment was measured by the scale most frequently used for this purpose (Morris & Sherman, 1981; Steers, 1977). Evidence of the construct validity of this 9-item scale (developed by Porter and Smith, 1970) is provided by Mowday, Steers, and Porter (1979).

Perceived Competence. The individual's basic psychological feelings of confidence and competence that result from mastery of the work environment were assessed with the 23-item index (Comp) developed by Wagner and Morse (1975). Initial validation studies of this measure (Morse, 1976; Wagner & Morse, 1975) have provided strong evidence that scores on this scale predict objective indices of work performance.

Leader Behavior. Two dimensions of leader behavior, consideration (11 items) and initiating structure (10 items), were measured using a sample of items from the supervisory behavior description questionnaire (Fleishman, 1957) and Form XII of the leader behavior description questionnaire (Stogdill, 1963).

Supervisor as Communicator. Four items (5-point scale, adapted from Olmstead and Christensen, 1973) were included in this instrument designed to assess the amount, timeliness, accuracy, and informativeness of communication regarding agency goals.

Evaluation of Performance Appraisal. This 4-item scale asked respondents to rate the timeliness, accuracy, utility, and fairness of the performance feedback that they were provided by their supervisor. A 5-point response format (strongly agree, agree, undecided, disagree, strongly disagree) followed each item.

Team Integration. This 7-item scale, adapted from Olmstead and Christensen (1973), was developed to assess the work group member's contribution to team development and the degree of interpersonal exchange and communication among work group members.

Role Conflict and Role Clarity. Perceptions of conflict (8 items) and clarity (6 items) were assessed with the 14 items developed by Rizzo, House, and Lirtzman (1970).

Role Clarity-Incentives. This 5-item scale developed by Miles (1974) assessed the extent to which the respondent was certain of what needed to be done on the job in order to obtain (a) a promotion, (b) a pay increase, (c) support and trust from the supervisor, (d) support and trust from work associates, and (e) progress toward career objectives.

Job Satisfaction. Respondent job satisfaction was assessed with the Job Descriptive Index (JDI) (Smith, Kendall, & Hulin, 1969). The JDI assesses five dimensions of job satisfaction: satisfaction with work, pay, promotion opportunities, supervision, and co-workers.

Analyses

The basic analytical strategies used were simple correlational analyses and multiple hierarchical regression (Cohen & Cohen, 1975). For the correlational analyses, the total sample was divided into four subgroups (male-supervisors, female-supervisors, male-nonsupervisors, and female-nonsupervisors). The multiple regression procedure used a set analysis with interaction terms that assessed sex and position effects. The constructs (social cues, situational information, personal evaluation) that comprise the sets of variables investigated were developed by Bruning and Snyder (1981) based on a review of the literature on sex differences in organizational behavior.

Results

The means and standard deviations are not given here because of space limitations. (They are available on request from the authors.) Coefficients of variation for all variables compared favorably with previous studies and indicated that the sample variance was representative.

Correlational analyses were conducted to determine the extent to which organizational commitment was differentially related to the remaining study variables for each of the subgroups. These results are presented in Table 1. The correlations between commitment and each remaining study variable were simultaneously compared across each of the four subgroups using the *U* statistic of Marascuilo (1971). Table 1 shows that these *U*-tests were statistically significant in only 1 of 14 possible cases. Furthermore, when the statistically significant case was examined further using the corresponding procedure for multiple comparisons of each *pair* of correlations, no significant effects due to sex alone were found. (At the suggestion of a reviewer, these analyses were repeated with the four subgroups collapsed into two, based on sex alone. The z tests relevant to these analyses were, once again, significant in only 1 of 14 comparisons.)

Table 1
Correlations between Organizational Commitment and Social, Situational, Personal, and Satisfaction Variables by Subgroup[a]

	Supervisors		*Nonsupervisors*		
Correlation between Organizational Commitment and:	*Male (N=195)*	*Female (N=167)*	*Male (N=57)*	*Female (N=164)*	*u*
Social cues					
Consideration (.84)	.27	.22	.35	.27	.85
Initiating structure (.80)	.26	–.01	.38	.20	8.83*
Supervisor's communication (.80)	.36	.35	.59	.33	4.97
Evaluation of performance appraisal (.79)	.36	.33	.64	.39	7.43
Team integration (.91)	.32	.42	.37	.18	5.99
Situational information					
Role conflict (.82)	–.14	–.17	–.44	–.34	7.64
Role clarity (.80)	.31	.36	.42	.30	1.05
Role clarity-incentive system (.77)	.34	.40	.51	.32	2.59
Personal evaluation					
Personal competence (.80)	.50	.42	.55	.42	2.19
Job satisfaction					
Satisfaction with work (.92)	.45	.38	.58	.48	3.10
Satisfaction with co-workers (.86)	.39	.34	.35	.31	.76
Satisfaction with supervision (.80)	.32	.20	.30	.23	1.76
Satisfaction with pay (.80)	.10	.10	.27	.19	2.01
Satisfaction with promotion (.84)	.32	.34	.48	.22	3.91

[a] Coefficient alphas appear in parentheses.

*$p < .05$

Multiple regression analyses were conducted to examine whether there were interactions between sex or position of the subject and the focal classes of variables in explaining organizational commitment. The variables (except the five satisfaction scales) were classified into three sets (social cues, situational information, personal evaluation) based on the framework developed by Bruning and Snyder (1981). This classification is shown in Table 1.

Interaction terms were constructed by separately multiplying the sex variable and the position variable by each of the variables in the set. The amount of incremental variation in organizational commitment accounted for by the six sets of independent variables (sex by variable set and position by variable set) was determined by multiple hierarchical regression (Cohen & Cohen, 1975). (Only the incremental variation of the interaction terms was evaluated because the objective was to examine sex and position differences in factors related to organizational commitment.) The set to be tested was entered into the equation after the other sets had been entered. The incremental variation (R^2) in the dependent variable accounted for by each set was calculated by subtracting the multiple R^2 before the final set was entered from the total multiple R^2. The significance of the incremental R^2 then was assessed with a partial F test (Cohen & Cohen, 1975).

The results for the regression analysis may be found in Table 2. Only two of six possible incremental effects were significant: one for sex and one for position. Obviously these results fail to provide evidence of pervasive sex or position differences in organizational commitment. Furthermore, although the regression results do suggest, for example, that sex interacts with personal evaluation, it should be recalled from the correlational analyses that no effects due to sex were detected for personal evaluation in the sex and position or sex-only analyses.

Table 2
Regression Analyses for Interactions Between Sex with Variable Classifications and Position with Variable Classifications

Variable Set(s) Omitted[a]	*Total* R^2	*Incremental* R^2	*Number of Variables in Incremental Set* (K_b)	*Partial* F	*Probability Value* (K_b,553)
Full model (no sets omitted)		.3737			
Social cues with sex	.3671	.0066	5	1.18	n.s.
Situational information with sex	.3662	.0075	3	2.21	n.s.
Personal evaluation with sex	.3641	.0096	1	8.48	$p<.01$
Social cues with position	.3589	.0148	5	2.61	$p<.05$
Situational information with position	.3667	.0070	3	2.06	n.s.
Personal evaluation with position	.3736	.0001	1	.09	n.s.

[a] The variable sets are: social cues—consideration, initiating structure, supervisor's communication, evaluation of performance appraisal, and team integration; situational information—role conflict, role clarity, role clarity-incentive system; personal evaluation—personal competence.

Conclusion

Although certain sex differences undeniably exist, the position of the present authors is that such differences may not be as pervasive as the organizational literature suggests. More specifically, the results of the present study do not support the hypothesis that sex differences in organizational commitment or factors related to commitment are universal. Logically, it is presumed that these results generalize best to public sector organizations and particularly those in which women have been traditionally employed. The authors do not believe, however, that the generalizability of the results is unusually limited. On one hand, the samples reported on in the organizational behavior literature today typically are so far removed from the relevant population (i.e., the American workforce) that the extent of external validity almost always is a legitimate concern. Yet, on the other hand, it is felt that the burden of proof of generalizability in the present study may be somewhat less than average because of the nature of the basic argument. It is not suggested that the present findings (i.e., no sex differences) will generalize to every type of organization or sample. Rather, it is argued that sex differences in commitment may not occur in every organization and that managers, therefore, should not assume that such differences exist. Managers need to verify the existence of potential sex differences before initiating programs that treat men and women differently. (Even if apparent sex differences exist, other relevant factors such as organizational position may be as important as sex in determining differences ordinarily attributed to sex alone.) This is quite different, it is believed, from studies that report a positive finding (e.g., sex differences exist in situation X). In this latter case, the implicit assumption is that those differences likely will be found in situation Y or Z as well.

The above argument notwithstanding, it may be appropriate for future researchers to investigate the extent to which the historical role of women in particular types of organizations affects the probability that sex differences will occur. At present, the impact on commitment of the traditional role of women remains unclear even within the particular type of organization studied here. It is clear, for example, that women have long been accepted in particular roles in social service organizations (a positive influence?). Yet, women historically, and presently, have not had equal access to higher paying administrative positions in such organizations (a negative influence?). At present, it is not possible to construct a compelling argument in either direction. The resolution of this and other situation-specific or organization-specific issues awaits future research.

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Sex Differences During Occupational Socialization

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Differences in work attitudes of men and women vary with occupation and years in the occupation. Differences are most pronounced for managers with little experience, and differences decline with length of experience in the occupation.

Recent concern with sex discrimination in pay and the tendency of many higher level occupations to remain sexually segregated has sparked an increased interest in sex related occupational research (Crawford, 1978; Fottler & Bain, 1980; Hall, 1976; Wheeler, 1981). To a large extent, this research emphasis in the 1970s and 1980s originated from the realization that most of the discrepancy in organizational rewards derived by men and women can be attributed to occupation segregation (U.S. Department of Labor, 1979).

A large body of research has shown that childhood socialization plays a significant role in molding work related attitudes that later contribute to occupational choice (Kohn, 1981; Kohn & Schooler, 1973, 1982; Mortimer & Lorence, 1979). By the same token, differences in work related attitudes between men and women that result from childhood socialization have been postulated to act as major factors leading to occupational segregation by sex (Bartol, 1976; Fottler & Bain, 1980; Shinar, 1975; Wheeler, 1981). In his review of the literature on women in management a few years ago, Terborg (1977) concluded that one of the greatest research needs in this area was to determine the extent to which a woman's self-concept, needs, and attitudes are modified by job experience. If the self-concept or attitudinal system of women changes in adulthood as a function of occupational experiences, then childhood socialization variables (e.g., mother's working role) may be less critical for occupational segregation than previously thought. Unfortunately, little empirical research has been done on the effect of occupational socialization on sex related work values and attitudes since Terborg's review.

The objective of this paper is to test the hypothesis that *when men and women are subject to the same occupational experiences, they tend to converge on their work related attitudes over time.* If women can "learn" on the job those attitudes that are associated with higher level occupations, then sex related work predispositions are not as important to a woman's future occupational level as has been suggested in some quarters (Fottler & Bain, 1980).

The attitudinal dimensions used in this study are commonly employed to describe sex differences in achievement motivation and occupational orientations. A contextual dimension concerns the importance of rewards derived from the job but external to the work itself (e.g., interpersonal relations, working conditions). In contrast, a task related dimension that is associated with higher level occupations involves rewards obtained directly from work experience (e.g., responsibility, challenge). Most empirical research suggests that women tend to rank contextual factors higher than task related factors (Centers & Bugental, 1966; Goodale & Hall, 1976; Taylor & Thompson, 1976; Wheeler, 1981). Another construct used in this study that has become increasingly important in both empirical investigation and theoretical speculation about sex related differences in work attitudes is job involvement. Job involvement has been defined as the degree to which one's work is an important part of his or her life (Lodahl & Kejner, 1965; Reitz & Jewell, 1979; Ruh, White, & Wood, 1975). Job involvement is of particular interest to this research because it is strongly correlated with occupational level and women tend to score lower than men on this dimension (Hunt & Saul, 1975; Reitz & Jewell, 1979).

If the hypothesis of this study is to be confirmed, one would expect to find that attitudinal differences between men and women tend to decline as they spend more years in the same occupation. Because the data reported here are cross-sectional in nature, the results are only suggestive and should be replicated when longitudinal data become available.

Method

Sample

All data were collected as part of a paper-and-pencil survey administered to 4,550 employees during the years 1978-1979. The participants were chosen via a stratified random approach from a cross-section of functional areas, occupational groups, and tenure cohorts. All of the employees were working for a large corporation with branches in most major U.S. cities. Of the 4,550 surveys mailed out, 1,432 males and 885 females completed the survey, for an overall return rate of 51 percent. The respondents were divided into the following four categories of occupations as specified by the U.S. Bureau of Labor Statistics: professional and technical ($N=859$ engineers); managers ($N=601$); clerical ($N=342$); and operatives ($N=515$ factory workers).

Attitudinal Measures

The instrument used to operationalize the attitudinal constructs was developed by a team of industrial psychologists associated with this organization.

Five items were designed to measure the task related values (responsibility, autonomy, ability utilization, accomplishment, and challenge). Seven items measured the contextual or extrinsic values (working conditions, company policy, company reputation, human relations, personal attention, compensation, and job security). The remaining item asked the employee about the overall importance of work to his or her life (job involvement). Employees rated each item on a 5-point Likert scale, using the following response format:

> On my ideal job, how important is it ... (1) not important; (2) somewhat important; (3) important; (4) very important; (5) extremely important.

An internal reliability analysis conducted on the present sample ($N=2,317$) indicated that the two composite scales met acceptable standards. (The job involvement measure was excluded from this analysis because it consisted of a single index.) The resulting Spearman-Brown coefficients were .79 and .76 for the task related and contextual scales, respectively, which are high relative to other similar scales (Blood, 1969; Murphy & Fraser, 1978; Wollach, Goodale, Wijting, & Smith, 1971). The reliability results were corroborated by a principal component factor analysis. The terminal solution (orthogonal varimax rotation with iteration) yielded a task related and a contextual factor (Table 1). Additional evidence supporting the validity of the instrument may be found in several replications of these findings using independent samples (Gomez-Mejia, 1981; Gomez-Mejia & Pettman, 1980).

Table 1
Principal Components Factor Analysis with Varimax Rotation—Task Related and Contextual Scales[a]
($N=2,317$)

Attitude Scales	*Factor 1*	*Factor 2*
1. The amount of responsibility in the job	46	—
2. The chance to do my work without much supervision	64	—
3. The chance to do something that makes use of my abilities	66	—
4. The feeling of accomplishment I get from the job	79	—
5. Being able to do work that is challenging	62	—
6. My working conditions (heating, lighting, cafeteria, etc.)	—	48
7. The policies of my company	—	67
8. The reputation of my company	—	40
9. The human relations climate (between me and my supervisor, in the work group, etc.)	—	45
10. Receiving attention from supervisor on personal problems	—	50
11. My total compensation, including salary and benefits	—	—
12. My job security	—	38
Eigenvalue	2.72	1.01
% of Var.	60	22

[a]Numbers in matrix represent factor loadings resulting from orthogonal varimax rotation. Decimal points are omitted, and only factor loadings of 35 or higher are shown.

Analysis

The task related and contextual indices were calculated for each respondent by unit weighting and averaging the item scores corresponding to each of these dimensions. Mean differences then were computed between men and women on each of these two measures and the job involvement index. This analysis was conducted separately by occupational group, and within each of these groups it was broken down by length of time in occupation. If the hypothesis of this study is to be confirmed, one would expect to find that the mean differences in work attitudes between the sexes would tend to decline within each occupational cohort as the number of years in that occupation increases.

Results

As can be seen in Table 2, five of the seven significant mean differences by sex are found in the low tenure category, and these occur in the management (three out of five) and engineer (two out of five) samples. The remaining two significant mean differences by sex occur among managers in the middle tenure group. No significant mean differences between men and women are observed in the high tenure group or in any of the clerical and factory cohorts.

The pattern in the data suggests an upward trend for women in the task related and job involvement mean scores as a function of occupational tenure; men do not exhibit a discernible trend on these attitudinal dimensions.

Discussion

The results reported here provide preliminary support to the hypothesis that occupational socialization tends to reduce sex differences on work related attitudes. The data suggest, however, that the generalizability of the relationship may be limited by worker and occupational characteristics. For future research, therefore, there remains the problem of explaining why the hypothesized relationship between length of socialization and work attitudes was observed for the higher occupational groups and for women, and not for clerical and factory workers or for men.

The observed pattern of mean scores in Table 2 suggests that, among managers and professonals, occupational socialization decreases the "attitudinal gap" between the sexes as a result of an increase in the task related and job involvement orientation of women. This pattern raises some interesting questions for future longitudinal research on the interaction among childhood socialization, occupational experiences, and sex related work attitudes. An issue that should be explored is the extent to which differences in childhood socialization by sex mediate the relationship between occupational socialization and work attitudes. For example, it may be that the socialization of women in childhood predisposes them to be more "malleable" in a social setting and to adapt their attitudes in ways consistent with the dominant referent other (Horner, 1972). Because women are in the minority at the higher occupational levels, normative pressures inside

Table 2
Average Work Attitude Scores by Occupation, Sex, and Length of Occupational Socialization[a] ($N = 2,317$)

	Number of Years in This Occupation								
	Low (0-3 years)			*Middle (4-10 years)*			*High (11+ years)*		
Attitude Scales	*Male*	*Female*	*Mean Differences*	*Male*	*Female*	*Mean Differences*	*Male*	*Female*	*Mean Differences*
Task related									
Managers	4.24	3.99	.25***	4.17	4.08	.09*	4.12	4.09	.03
Engineers	4.08	3.95	.13*	4.12	4.09	.03	4.15	4.12	.03
Clerical workers	3.95	3.89	.06	3.93	3.92	.01	3.93	3.92	.01
Factory workers	3.71	3.68	.03	3.72	3.69	.03	3.75	3.73	.02
Contextual									
Managers	3.92	4.05	-.13*	3.91	3.95	-.04	3.91	3.94	-.03
Engineers	4.03	4.10	-.07	4.03	4.05	-.02	4.00	4.01	-.01
Clerical workers	4.08	4.13	-.05	4.08	4.10	-.02	4.09	4.09	.00
Factory workers	4.05	4.05	.00	4.09	4.12	-.03	4.10	4.14	-.04
Job involvement									
Managers	4.23	4.01	.22***	4.19	4.10	.09*	4.24	4.21	.03
Engineers	4.04	3.90	.14**	4.06	3.99	.07	4.02	4.01	.01
Clerical workers	3.76	3.69	.07	3.81	3.78	.03	3.79	3.80	.01
Factory workers	3.34	3.41	-.07	3.60	3.54	.06	3.57	3.58	-.01
Sample sizes (N)									
Managers	105	81	—	105	38	—	231	41	—
Engineers	200	60	—	209	41	—	300	49	—
Clerical workers	48	103	—	35	59	—	27	70	—
Factory workers	82	205	—	56	91	—	34	47	—

[a] The task related and contextual scores are the summated scale values for all the items in each of the corresponding factors divided by the number of items. The numbers reported in the matrix consist of the average scale values for each of the corresponding samples.

*$p \leq .05$

**$p \leq .01$

***$p \leq .001$

these groups are more likely to influence their work related attitudes. A second area of inquiry for future research is the extent to which, on entering a managerial or professional career, a woman is more apt to show a greater change in task related attitudes than are men who have started at a higher point in the learning curve for the "appropriate" work attitudes. Indirect support for this hypothesis may be found in a recent study of the effects of management training programs for men and women (Gomez-Mejia & Balkin, 1980). Whatever the reasons for the findings reported here, this study does not support the contention that a woman's work orientation has already been molded prior to entering the world of work. Fottler and Bain, for example, recently lamented that "at a time when external barriers to women are being cast aside through legislation and vocal disavowal of sex-role stereotypes in some quarters, there apparently are deep-rooted attitudes that continue to direct both sexes toward traditional occupational roles" (1980, p. 148). Although Fottler and Bain and a great number of other studies (Crawford, 1978; Hall, 1972; Horner, 1972; Tipton, 1976) have focused on childhood socialization variables that may lead to divergent occupational choices for men and women, little research has been done on the effect of common occupational experiences in reducing attitudinal differences between the sexes.

To the extent that a strong task related and job involvement orientation is associated with male dominated managerial and professional careers (Centers & Bugental, 1966) and women tend to score lower than men on these dimensions (Bartol, 1976; Reitz & Jewell, 1979), male-female differences among entrants will be greater in these occupations than in others. This study suggests, however, that if women are given appropriate opportunities they may internalize on the job those norms/attitudes associated with their male counterparts in these occupations.

Although attitudes play a significant role in continued sexual segregation by occupation, the underlying causes are many and complex. Additional reasons that have been proposed include the cultural values of society (Psathas, 1968; Tipton, 1976); early childhood experiences (Hall, 1976); negative impact of a demanding career on family life (McClure & Piel, 1978); role conflict (Hall, 1972), "sexist" school counseling (Ahrons, 1976), lack of self-confidence (Lenny, 1977); and outright discrimination (Terborg & Ilgen, 1975). The interaction and relative effects of these factors are still unclear. The study of these issues is important because continued occupational segregation by sex will mean continued underutilization of almost one half of the labor force. Longitudinal research especially is needed on the entire occupational choice-socialization process for women. Research areas that still need to be explored and integrated include how women collect and evaluate information when they choose a given occupation, the relevant variables at the anticipatory socialization stage, and how male dominated groups affect women who enter managerial and professional jobs.

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Effects of Social Context on Consensus and Majority Vote Decision Making[1]

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A laboratory study of group decision making found that social context (competitive or cooperative) and decision strategy (consensus or majority voting) affected decision acceptance, understanding, decision time, and affective reactions to the group, although decision quality was not affected.

Because several persons can combine ideas, correct errors, and stimulate thinking to create and evaluate solutions, groups are thought to have great potential for decision making. Considerable research suggests that groups typically make decisions superior to those made by individuals (Kelley & Thibaut, 1968; Nichols & Day, 1982) and induce greater acceptance of the decision (Maier, 1970) and more understanding of the problem (Laughlin, 1978). But not all groups are effective. Janis's (1972) work on groupthink dramatically illustrates that members sometimes conform, stifle discussion, and make unreasonable decisions. Researchers have identified several approaches to structure group interaction to improve decision making (Herbert & Yost, 1979; Van de Ven & Delbecq, 1974; White, Dittrich, & Lang, 1980). Consensus decision making, compared to majority vote, has long been thought to be effective because the views and ideas of all group members are considered and not hastily dismissed as unimportant minority opinion (Hall, 1971; Maier, 1970). The social context may affect the usefulness of consensus and majority vote. In particular, this study investigates the consequences of consensus and majority vote approaches to group decision making in a cooperative and competitive social context on the quality of commitment to the decision, individual understanding of the problem, time needed to make the decision, and attitudes toward the group.

Consensus and majority vote stipulate the rule that groups are to use to make their decisions. In consensus decision making, all group members

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express their opinions, discuss the issue, and then choose an alternative they all can agree to, at least in part. Majority vote selects the alternative that more than half the group members think should be accepted. The cooperative and competitive context may affect the success of consensus and majority vote approaches. Cooperation occurs when persons perceive that their goals are positively linked: one's goal attainment helps others reach their goals (Deutsch, 1949, 1973). In competition, persons believe that their goals are negatively linked: one's goal attainment interferes with others' goals. The emphasis in competition is on winning and outdoing others; in cooperation, it is on working together for joint benefit.

Consensus is thought to contribute substantially to decision making. Hall (1971) argued that in consensus, opposing opinions are addressed directly, as all persons are encouraged to express their own views, and this open controversy results in a thorough exploration of the problem, understanding among group members, and the creation of high quality solutions to which members are committed. Groups that discuss controversy openly have been shown to be effective decision makers (Janis, 1972; Maier, 1970; Maier & Hoffman, 1964). Yet it is the skillfully managed, constructive controversy that promotes decision making. Considerable research supports Deutsch's (1973) argument that social context affects the course and outcomes of conflict and that cooperation results in constructive conflict. Group members who discuss their controversy in a cooperative context have been found to understand and incorporate each other's ideas into an effective decision. In competition, they were closed minded to using each other's ideas to make their decisions (Tjosvold, 1982; Tjosvold & Deemer, 1980). *It is hypothesized*, therefore, *that groups using consensus decision making are more effective under cooperative conditions than under competitive conditions.*

Majority vote may be useful when persons are in competition. Competitors express their own views to try to win and show that their ideas are better than others. They may be less interested in understanding, responding, and incorporating each other's ideas. Because they are not likely to compromise easily, they may welcome a majority vote rule as a way to end their conflicts, whereas consensus only prolongs them. *It is hypothesized that in competition, groups using majority vote, compared to consensus, use less time and have more positive attitudes toward their group.*

Method

Subjects

The participants were 114 undergraduates from Simon Fraser University, who were randomly assigned to 4 conditions and placed in groups of 5 with 1 group of 4. There were five groups in competitive-consensus and six groups in the other conditions. Subjects were given course credits for their participation in the study.

Procedures

The experiment had three phases. In phase 1, all subjects individually made their decisions on the rank order of importance of 15 items that may help persons return to the mother ship in the "Lost on the Moon" exercise (Hall, 1971). In phase 2, they were placed in groups and read the instructions that included the experimental inductions. They then discussed the issue and made their group decisions. In the last phase, the subjects individually indicated their decision and completed a questionnaire on their attitudes toward their group.

The experimental inductions were introduced when the subjects first formed their groups. In the cooperative conditions, subjects read that they were to work together for mutual benefit and not to try to win or outdo others. They were to search for a solution that was good for all. In the competitive conditions, subjects were told they were to try to win and show that their own ideas were superior to others. Subjects also were told that they were to make their decision through consensus or majority vote. Subjects in the consensus condition read that they were to reach decisions that everyone could agree to, at least in part. They were not to rely just on majority rule, but the decisions should be acceptable to all. In the voting condition, groups were told that the majority vote would determine the group's decisions. The experimenter answered questions and checked to make sure that all subjects understood the instructions. The groups had up to 60 minutes to complete the task.

Dependent Measures

The dependent variables were: quality of the group decision, individual commitment to the decision, understanding of the problem, time needed, and attitudes toward the group. To measure the quality of the group's decision, the absolute difference between the group's ranking and the correct one was computed. A similar procedure was used to measure individual understanding of the problem: the individual's post group discussion ranking was compared to the correct one. To measure individual commitment to the group decisions, individual subjects' post discussion ranking was compared to their group's ranking. The lower the score, the more adequate the group's decision, the more individual understanding of the problem, and the greater the commitment to the group's decision.

After the discussion the subjects indicated on a questionnaire their attitudes toward their group: specifically, their beliefs about how effective their group was and their desire to work again with this same group. They used a 7-point scale with 7 labeled "a great deal" and 1 labeled "a very little" to indicate the extent to which they believed their group was effective overall and the extent to which they wanted to work again with this group.

Intercorrelations among the dependent measures were computed (Table 1). Individual understanding of the problem was related to decision quality

Table 1
Intercorrelations Among Dependent Measures

	Decision Quality	*Decision Commitment*	*Understanding*	*Time*	*Perceived Effectiveness of Group*
Commitment	.10				
Understanding	.56***	.47***			
Time	-.21**	-.09	-.09		
Effectiveness	-.14*	-.01	-.05	-.03	
Willingness to work again	-.07	-.05	-.01	-.01	.46***

$^{*}p<.10$
$^{**}p<.05$
$^{***}p<.01$

and commitment to the decision. Individuals who learned in the discussion appear not only to have helped the group make a high quality decision, but also to become committed to that decision. Perhaps they also learned by being convinced of the group's arguments and decisions. Time was negatively related to decision quality, largely because subjects in the competitive-consensus condition took considerable time to make low quality decisions. Perceived effectiveness was moderately but negatively related to group decision quality but was related to willingness to work again with the group. Subjects appear to have based their desire to work with the group on their perception of effectiveness rather than on actual group effectiveness.

Results

All subjects individually made the decision before they formed groups. No significant or nearly significant findings were obtained among conditions on this prediscussion individual decision. The means for the conditions are 48.97 for cooperative consensus, 47 for cooperative voting, 44.17 for competitive consensus, and 48.40 for competitive voting. The lack of statistically significant findings indicates that, as expected, general understanding of the problem was roughly equally distributed across experimental conditions.

Two items were included on the postdiscussion questionnaire to measure the effectiveness of the inductions. Subjects were asked to describe their relationships in their group on a 7-point scale with 1 labeled "very competitive," 4 as "neither competitive nor cooperative," and 7 as "very cooperative." As expected, subjects in the cooperative condition ($M=5.34$) indicated that their relationship was more cooperative than did subjects in the competitive condition ($M=3.21$), [$F(1, 112)=21.87$, $p<.01$]. Subjects also described how their group made its decisions by checking either "decided by voting" or "we all tried to agree on the decisions." To compare, the voting option was scored as 1 and consensus as 2. The analysis indicated that, as expected, subjects in the voting condition ($M=1.33$) indicated that they made decisions by voting, versus subjects in the consensus

Table 2
Comparisons Among Dependent Measures[a]

	Cooperation		*Competition*		
	Consensus	*Voting*	*Consensus*	*Voting*	*F*
Decision quality	35.33	29.33	33.40	37.67	
Decision commitment	10.87	14.63	6.70	18.10	Consensus vs. voting, 8.21***
Understanding	35.93	32.57	35.50	38.93	Cooperative vs. competitive, 4.56**
Time	29.17	39.33	55.20	37.67	Cooperative vs. competitive, 10.29*** Interaction, 14.83***
Perceived effectiveness of group	5.34	4.97	5.09	5.43	Interaction, 3.27*
Willingness to work again	5.07	4.50	4.61	5.10	Interaction, 3.09*

[a] The higher the score, the lower the decision quality, decision commitment, and understanding. Time is in minutes. The higher the score, the greater the perceived effectiveness of the group and willingness to work again with the group.

*$p<.10$

**$p<.05$

***$p<.01$

condition ($M=1.96$), [$F(1,112)=22.26, p<.01$]. These results indicate that the conditions necessary to test the hypothesis were created.

Contrary to expectations, groups from the different conditions did not differ significantly in the quality of their decisions (Table 2). However, subjects in the consensus condition revealed that they were more committed to their own group's decision than did subjects in the voting condition. In addition, subjects in the cooperative condition showed more individual understanding of the problem by making more accurate decisions than did those in the competitive condition.

The analysis of time to make the decision yielded both a main effect for social context and a two-way interaction. Overall, the cooperative subjects completed their decision more quickly than did competitive subjects. The significant interaction suggests that the method of decision had quite a different impact, depending on the social context. Consensus seemed to facilitate quick decisions under the cooperative condition, whereas voting facilitated speed under the competitive condition.

The social context and decision making method may have interacted to affect attitudes toward the group. However, the interactions were only marginally significant ($p<.10$) and suggestive. Overall, these results suggest that in a cooperative context, consensus facilitates perception of the group as effective and a group with which one would want to work again. In a competitive context, the voting method seems to have induced more favorable attitudes.

Discussion

Groups have been thought to promote acceptance of a decision and understanding of the problem (Laughlin, 1978; Maier, 1970; Vroom &

Yetton, 1973). Results of this study, although limited by the type of task, the size and number in its sample, and other aspects of its operations, suggest the conditions that affect these outcomes of group decision making. Consensus appears to facilitate acceptance of the group's decision. Subjects' own personal decisions were closer to those of their group when their group used consensus rather than majority vote to make the decision. Perhaps persons in consensus both can influence their group decision to be close to their own and are more open to changing their ideas to support their group's decision than are persons who vote to make decisions. Results of this study also suggest that a cooperative context encourages learning. Group members in cooperation appear to have exchanged ideas and understood each other to learn about the problem, whereas those in competition were more closed minded to each other's perspectives and learned less.

Results provide some support for the idea that the success of consensus and majority vote decision making depends on the social context. Groups in cooperation made their consensus decisions more quickly than did those in competition; however, in competition the majority vote groups made decisions more quickly than did consensus ones. Indeed, the competitive-consensus group used nearly all the time allowed to make the decision. Also, subjects in cooperation tended to believe that their consensus group was more effective and desirable than the voting group; subjects in competition thought their majority vote group was more effective and desirable than the consensus groups. Taken together, these results suggest that the complaint that consensus decision making is time consuming and frustrating holds more when persons try to compete and outdo each other than when they work for mutual benefits.

Consensus-cooperative groups were expected to exchange information, correct errors, and stimulate thinking through constructive discussion of opposing views to arrive at high quality decisions. However, the analysis yielded no significant differences on the measure of decision quality. The task may not have lent itself to effective group consideration. Laughlin (1978) and Laughlin and Adamopoulous (1980) found that groups are successful problem solvers on intellective rather than judgmental tasks. Intellective tasks have a clearly demonstrable, correct answer. The task for this study is structured in that there is a correct answer (Herbert & Yost, 1979), but it is not a fully intellective one, because persons with the correct answers cannot always persuade even reasonable others. Future research could investigate the effects of consensus and majority vote decision making in different social contexts on intellective and judgmental tasks.

Researchers have tried to identify the conditions that facilitate group decision making on quality and acceptance of the decision and understanding of the problem. Training in human relations skills and experience in the group have been found to aid group decision making (Hall, 1971; Hall & Williams, 1970). The Delphi method and nominal group technique can provide a structure for groups without such training and experience (Van de Ven & Delbecq, 1974). The results of this study suggest that consensus decision making can induce commitment to the decision in that the individual's and group's decisions are congruent. A cooperative context was found to facilitate learning about the problem under discussion and to help consensus decision making groups use their time efficiently. Results also suggest that when persons feel competitive toward each other, a majority vote rule may be a reasonable way to reduce the controversy and the time needed for group decision making.

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Apples and Oranges: An Empirical Comparison of Commonly Used Indices of Interrater Agreement[1]

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Empirical comparison of common indices of interrater agreement indicated that the indices are not directly comparable in regard to the magnitude of the estimates produced or the information conveyed. Some of the indices may be severely distorted if applied to homogeneous sets of ratings. Although analyses of ratings at an item level might suggest inadequate agreement, composites of those items may yield satisfactory indications of interrater agreement.

In their growing concerns over the objective accuracy of scores used to describe work conditions or job related events, organizational researchers have turned increasingly to the use of average ratings derived from multiple observers. This approach is most frequent in efforts involving structured job analysis (Cornelius, Carron, & Collins, 1979; Levine, Ash, & Bennett, 1980; McCormick, Jeanneret, & Mecham, 1972; Taylor, 1978; Taylor & Colbert, 1978) and in studies of organizational climate (Drexler, 1977; Jones & James, 1979). It is encountered also in performance appraisal, assessment of leader behavior, and a variety of other areas in which objective accuracy of the data is an issue (Arvey & Ivancevich, 1980; Greene, 1975; Ilgen & Fujii, 1976; Kenny & Berman, 1980; Landy & Farr, 1980). As discussed by Jones and James (1979), the basic premise underlying the use of multiple raters is that minor variations due to individual differences

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in perceiving or reporting events will be cancelled out. Thus the resulting score will be a more accurate representation of experiences likely to be felt by any person in a similar situation. Most studies provide empirical support for this assumption by reporting some statistical index of agreement among the raters.

It is in the selection and interpretation of these indices of agreement that one encounters a substantial level of confusion (James, 1982). Few explicit guidelines exist for comparing or selecting among the variety of techniques that have been used. Studies appear to choose techniques somewhat arbitrarily, exercise widely different latitudes of acceptance in determining the adequacy of reported values, and all too frequently seem unaware of the information that is actually conveyed by the index chosen.

The degree of variation can be seen quite readily in recent studies. For example, Ilgen and Fujii (1976) used behaviorally based ratings by four trained observers and by workgroup members to measure leader consideration and initiating structure. Interrater agreement was computed in terms of average pairwise correlation coefficients and yielded values ranging from .06 to .43 for workgroup members and from .66 to .96 for the trained observers. Curtis, Smith, and Smoll (1979) also used observer ratings to study the effects of leadership differences among Little League Baseball coaches. These authors indicated an average interobserver reliability of .88, although the method of computing the estimate was not reported. In a third study, Borman (1982) used rater pairs to assess performance for soldiers in the U.S. Army's recruiting school. Based on unspecified reliability indices (presumably, pairwise correlation coefficients) that varied between .44 and .92 (median = .76), he concluded that interrater agreement was generally high. Similarly, Greene (1975) used peer ratings of subordinate performance to study possible reciprocal relationships with leader behavior. Estimates of interrater agreement were obtained by applying a Spearman-Brown correction to an unspecified reliability coefficient. The resulting values ranged from .75 to .89. In a slightly different vein, Sackett and Wilson (1982) explored factors that affected the consensus judgment process in a middle management assessment center and reported interrater agreement in terms of a percent of disagreement on relevant dimension scores. The reported values ranged from a low of 4.6 percent to a high of 37.4 percent.

Differences in selecting and reporting indices of agreement appear even more pronounced when one considers a broader range of studies. For example, Drexler (1977) used the F and ω^2 values derived from a one-way analysis of variance to summarize levels of agreement for ratings of organizational climate. Jones and James (1979) addressed similar concerns about agreement by reporting intraclass correlation coefficients. Finally, Jenkins, Nadler, Lawler, and Cammann (1975) introduced still another basis of comparison when they used a weighted kappa to assess interrater agreement on ratings of perceived job characteristics, and Caldwell and O'Reilly (1982) used a nonparametric χ^2 and the T index (Tinsley & Weiss, 1975) to assess agreement on supervisor's descriptions of job duties.

Even when studies use the same instruments, one finds wide diversity in the reported estimates of interrater agreement. The original research on the Position Analysis Questionnaire (PAQ) used the Spearman-Brown formula to estimate interrater agreement on judgments about worker attributes needed to perform a task but calculated average pairwise correlation coefficients to estimate agreement on judgments about job elements (McCormick et al., 1972). When computed on individual items, these techniques yielded a median Spearman-Brown coefficient of .91 and a mean pairwise correlation of .80. Subsequent studies of the PAQ generally have used the pairwise correlation coefficient to assess agreement, but they have differed in the manner in which the results were presented or in the level of data analyzed. Cornelius et al. (1979) analyzed items and reported a median pairwise estimate of .59. Taylor (1978) calculated agreement on the 27 component and 5 overall dimension scores of the PAQ and reported mean estimates of .61 and .90, respectively.

A reader with the appropriate statistical background probably will encounter relatively little difficulty in deciphering the above diversity of techniques or determining the appropriate estimate to use in any particular situation. Unfortunately, the researcher who relies on published precedent to select an appropriate statistic or who is not as sophisticated in the basic assumptions underlying each technique is likely to find the choice less clear in the face of seemingly subtle differences. For this reason, the present study (a) briefly reviews the underlying assumptions and information conveyed by the most popular indices used to reflect interrater agreement and (b) compares results obtained when the various indices are applied to a common set of ratings.

Indices of Interrater Agreement

A major source of confusion lies in the treatment by different authors of similar ratings (even those derived from the same instrument) as if they possessed different mathematical properties. For example, some authors (Jenkins et al., 1975) treated the response options on Likert format scales as discrete, rank-ordered categories when assessing interrater agreement. Such authors generally have reported indices that reflect the proportion of raters who assign the rated object to the same or similar categories. Other authors (Cornelius et al., 1979; McCormick et al., 1972) treated identical Likert format ratings as continuous scores and estimated agreement for each item. Still others (Taylor, 1978) computed scores for composites of items or created factor scores before addressing the issue of interrater agreement. Such studies generally report estimates of interrater agreement based on some aspect of score variance. Because differences in assumptions about the categorical versus continuous nature of the ratings have implications for the choice of statistics used to estimate interrater agreement, the two approaches are discussed separately below.

Categorical Data

When ratings are assumed to reflect assignment to mutually exclusive categories, the intuitively obvious index of interrater agreement is the simple, uncorrected percent of raters that assign an individual or object to the same group (i.e., percent agreement). This index is seldom used, however, because it is susceptible to both *overestimation* and *underestimation* of the actual level of agreement (Cohen, 1968; Jenkins et al., 1975; Mitchell, 1979; Repp, Deitz, Boles, Deitz, & Repp, 1976). The tendency toward overestimation is present because the index contains no correction for ratings that coincide strictly by chance. Behaviors with either very high or very low frequencies of occurrence are likely to produce high chance levels of agreement and thus yield overly optimistic estimates. The tendency toward underestimation is present whenever ratings reflect assignment to rank-ordered categories because percent of agreement treats assignment into adjacent or similar categories as reflecting the same amount of disagreement as assignment into highly dissimilar categories.

To compensate for such shortcomings in the use of proportions as indices of agreement, Cohen (1960, 1968) introduced kappa ($\varkappa$) and weighted kappa ($\varkappa_w$). Both statistics assess agreement after correcting for chance, but $\varkappa_w$ additionally assigns partial credit to ratings that are similar but not identical. On the surface, the kappa statistics seem to resolve most of the problems faced by percent agreement. However, they assume that the selection of a category in one observation is independent of the selection of a category on successive observations. Further, observations should not be concentrated in a few cells. Such assumptions may be violated easily if one is rating highly similar objects. Consider two individuals rating a homogeneous set of jobs on an attribute that is obvious and easy to rate. The homogeneity increases the probability that a high proportion of scores will be assigned to one or two rating categories while other categories receive small or nonexistent proportions. This distribution violates the assumption on which $\varkappa$ and $\varkappa_w$ are based and tends to reduce the power of these tests to a point of providing little useful information (Burton, 1981; Overall, 1980).

Continuous Data

Studies that treat ratings of job attributes as continuous scores are more common than studies that treat the data as categorical in nature. Thus, the most frequently encountered index of interrater agreement is the average pairwise correlation coefficient (Bernardin, Alvares, & Cranny, 1976; Cornelius et al., 1979; Ilgen & Fujii, 1976; Smith & Hakel, 1979; Taylor, 1978). Generally, this estimate is obtained by calculating a Pearson product-moment correlation across all pairs of individuals who rated the same object. The resulting correlations are then averaged using a Fisher r to z transformation, although as noted earlier some authors summarize the level of interrater agreement by a median rather than a mean score.

In spite of its popularity as an estimate of agreement among raters, the average pairwise correlation has certain drawbacks. First, although this statistic describes the degree to which the scores produced by each rater vary systematically when compared to scores produced by another rater, it says nothing about the degree to which the scores themselves are identical (Cohen & Cohen, 1975). For example, ratings that show similar profiles of variation will produce high pairwise correlations even if the actual scores differ systematically by several points. Ebel (1951) noted a number of other limitations in the use of pairwise correlations, among them the necessity for the table of comparisons to be complete or information is lost. Another limitation is that between-rater variance always is removed in computing the product-moment formula. He noted that the last point is a problem especially when comparisons are made among single raw scores assigned to different subjects by different raters. In that case, the between-rater variance should be included in the error term and the product-moment correlation should *not* be used as an index of agreement. For such reasons, Ebel and others (Bartko, 1966, 1976; James, 1982; Selvage, 1976; Winer, 1971) advocated the use of the intraclass correlation as an index of interrater agreement because it permits the researcher to choose whether or not to include the between-rater variance in the error term.

Despite this advantage, the intraclass correlation (because it is based on the ANOVA paradigm) suffers many of the same criticisms mentioned earlier. For example, Selvage (1976) noted that ANOVA fails to produce coefficients that reflect the consistency of ratings when assumptions of normality are grossly violated. Further, ANOVA requires substantial between-item variance to produce a significant indication of agreement (Finn, 1970; Selvage, 1976). Thus, the example regarding the rating of a homogeneous set of jobs given earlier in the discussion of $\varkappa$ also would violate the underlying assumptions of ANOVA and distort the intraclass correlation as an index of interrater agreement.

A final, frequently used index of interrater agreement assesses agreement in terms of the estimated stability of the score produced when individual ratings are averaged. Most common is the Spearman-Brown formula (Ebel, 1951; McCormick et al., 1972). As Jones and James (1979) noted, however, the Spearman-Brown formula addresses the degree to which a parallel sample of raters would produce an average score similar to the one obtained in the current sample and does not address directly the issue of agreement among raters. They argued that "the Spearman-Brown formula is not well suited to [assessing agreement among] large numbers of raters. . . large sample sizes tend to yield high estimates of mean score reliability even when relatively heterogeneous individual scores are used to compute such means. Thus the reliability of the mean score appears to provide an overly optimistic estimate of agreement" (1979, p. 207).

Based on the foregoing discussion, it is evident that the different indices do not provide equivalent information about possible levels of interrater agreement. Few studies, however, report data about more than one aspect of agreement. Thus few empirical bases of comparison exist to allow the reader to evaluate more effectively the data that are presented. The present study was designed to be a step in providing that empirical base by calculating the various indices of agreement on a variety of ratings of specific job characteristics. Although the above-cited difficulties apply to a wide range of research issues and instruments, the PAQ was chosen as the appropriate instrument for comparison in the present study because of its popularity, because extensive validation data already exist, and because it contains rating scales of the type that have been analyzed as both categorical and continuous data in the past. Further, the existence of well-validated component scores permits a comparison of estimates for both items and higher order dimensions. Thus, findings based on this instrument appear likely to possess a wider range of generalizability or applicability than would result from other potentially interesting instruments.

Method

A listing of civilian employee positions was obtained from a medium-sized military hospital with approximately 1,100 employees. These positions represented 89 separate job titles or categories, each uniquely identified by a Civil Service Commission job code, pay grade range, and a designator noting whether or not the position was supervisory in nature. Extensive narrative descriptions of each job category were obtained from the U.S. Civil Service Commission Qualifications standards (1978). These descriptions contained detailed information about the scope of job duties, experience and training requirements, supervisory controls, and general work conditions typically encountered by incumbents in each category. The reader is referred to Jones, Main, Butler, and Johnson (1982) for a more detailed discussion of job categories and rating methods.

Four graduate level psychology students trained in the use of the PAQ were asked to rate the above job descriptions. The PAQ is an extensive questionnaire divided into six major sections (information input, mental processes, work output, relationships with other people, job context, and other job characteristics). Job analysts or incumbents are required to evaluate the job in terms of the degree to which the elements listed in each section are integral parts of the work. The majority of the ratings are on 6-point (0-5) Likert format scales with specific anchors for each point, although a small number of the ratings use dichotomous (0-1) ratings. Of the job categories, 25 were selected at random for rating by all four raters; the remaining 64 jobs were rated by two raters. For comparative purposes, each of the indices of interrater agreement discussed earlier was computed on all items and, as appropriate, on job dimension scores.

Results

Table 1 presents a summary of the agreement estimates obtained by using each technique. These estimates are presented in terms of the number of

Table 1
Frequency Distribution of Estimates of Interrater Agreement Computed on PAQ Job Element Ratings

	Kappa		*Weighted Kappa*		*Percent Agreement*		*Average Correlation*		*Intraclass Correlation*		*Spearman-Brown*	
Range	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*
.91-1.00	1	.7	1	.7	8	5.9	2	1.5	1	.7	12	8.8
.81-.90	—	.7	—	.7	18	19.1	5	5.1	5	4.4	27	28.7
.71-.80	—	.7	—	.7	26	38.2	17	17.6	6	8.8	31	51.5
.61-.70	—	.7	4	3.7	25	56.6	18	30.9	12	17.6	18	64.7
.51-.60	5	4.4	5	7.3	13	66.2	27	50.7	16	29.4	3	66.9
.41-.50	10	11.8	17	19.8	21	81.6	20	65.4	24	47.1	8	72.8
.31-.40	14	22.0	22	36.0	12	90.4	9	72.1	22	63.2	7	77.9
.21-.30	35	47.8	23	53.0	10	97.8	11	80.1	6	67.6	11	86.0
.11-.20	35	73.5	29	74.3	3	100.0	13	89.7	15	78.7	2	87.5
≤.10	36	100.0	35	100.0	—	100.0	14	100.0	29	100.0	17	100.0
Median value		.19		.22		.63		.51		.39		.73

coefficients lying within a given range. In general, κ and κ_w provided the lowest estimates of interrater agreement, producing median values of .19 and .22, respectively. (The median value was chosen as a basis of comparison because it appeared to reflect the distribution of coefficients more accurately than did the mean value. Further, no commonly agreed upon procedure, such as the Fisher r to z transformation, was found that would provide comparability across means computed on all the different indices.) Conversely, the percent agreement and Spearman-Brown approaches provided the highest indication of interrater agreement, with median values of .63 and .73, respectively. Finally, the average pairwise correlation and intraclass techniques occupied an immediate position, as indicated by median values of .51 and .39 respectively. In computing the intraclass correlation coefficient, the between-rater variance was assigned to the error term (Ebel, 1951).

Table 2
Estimates of Interrater Agreement for Different Data Distributions

Distributional Conditions	*Kappa*	*Weighted Kappa*	*Percent Agreement*	*Average Correlation*	*Intraclass Correlation*	*Spearman-Brown*
A. Variations in ratings across jobs and high agreement among raters (item 21)	.43	.45	.88	.79	.74	.92
B. Variations in ratings across jobs and low agreement among raters (item 153)	.01	.04	.16	.13	.05	-.23
C. Little variation in ratings across jobs and high agreement among raters (item 27)	.04	.04	.77	-.01	-.03	-.14

An examination of estimates on an item-by-item basis suggested, however, that these median values might be misleading. As seen in Table 2, the underlying distribution of the data may have a substantial effect on the ability of a particular estimate to reflect the actual level of interrater agreement. When there was a moderate to high degree of variation in the ratings assigned to different jobs, it made little difference what statistical estimate was calculated. Each technique provided comparable information about relatively higher (condition A) or lower (condition B) levels of agreement among raters. Problems arose, however, when there was high agreement among raters and very little variation in the ratings of a characteristic across jobs (condition C). In this condition, percent agreement suggested nearly 80 percent similarity on the actual ratings, but the other indices suggested no agreement beyond chance. On another item (not reported in the table), identical category assignment for 97 percent of the ratings yielded indications of very low interrater agreement for all estimates except percent agreement because the raters assigned most of the jobs to a single category.

Thus, under conditions of restricted variance in the ratings, only percent agreement appeared to provide an accurate indication of rating overlap. (A fourth condition is conceptually possible but was not encountered in the present data. This condition, in which raters generally disagreed with each other and assigned little variation to ratings across jobs, also would be expected to yield low indices of agreement.)

As noted earlier, assessments of interrater agreement frequently are conducted after ratings on individual items have been combined into higher order dimensions or transformed scores (Jones & James, 1979; Taylor, 1978). For this reason, the ratings were scored on the job dimensions described by McCormick et al. (1972), and appropriate estimates of agreement were calculated. As seen in Table 3, the resulting indications of interrater agreement generally were higher than those reported for individual items.

Table 3
Frequency Distribution for Estimates of Interrater Agreement for 24 PAQ Job Dimension and 5 Overall Scores

	Average Correlation		*Intraclass Correlation*		*Spearman-Brown*	
	Freq.	*Cum. %*	*Freq.*	*Cum. %*	*Freq.*	*Cum. %*
.91-1.00	1	3.4	—	.0	13	44.8
.81-.90	8	23.1	3	10.3	6	65.5
.71-.80	5	48.3	10	44.8	5	82.8
.61-.70	7	72.4	4	58.6	4	96.5
.51-.60	4	86.2	2	65.5	1	100.0
.41-.50	3	96.5	5	82.8	—	100.0
.31-.40	1	100.0	2	89.6	—	100.0
.21-.30	—	100.0	3	100.0	—	100.0
.11-.20	—	100.0	—	100.0	—	100.0
.00-.10	—	100.0	—	100.0	—	100.0
Median		.70		.63		.89

Discussion

The present study was intended to provide increased understanding of issues underlying the assessment of interrater agreement through an empirical comparison of indices commonly reported in the organizational literature. This comparison underscored a number of points that must be kept in mind when calculating or interpreting such estimates. First, the different indices are not identical in terms of the magnitude of the estimates produced or in the basic questions addressed. Second, some of the indices may be severely distorted if applied to homogeneous sets of ratings. Third, ratings that do not appear to reach adequate levels of interrater agreement for specific items may still provide normally acceptable indications of agreement when combined across items or transformed to reflect scores on higher order dimensions.

In many ways, the first of these points is the most important because of implications for the choice and interpretation of techniques. Techniques (i.e., $\varkappa$, $\varkappa_w$) that assume that the ratings reflect assignment to discrete categories generally produced estimates of agreement lower than those produced by the average pairwise correlations, whereas the estimates of agreement provided by the Spearman-Brown formula were consistently higher. So that the foregoing statement is not viewed as advocating the use of techniques that produce the highest values, one must consider the differences in the information provided. For example, only certain techniques ($\varkappa$, $\varkappa_w$, percent agreement, r_{ic}) directly assess agreement among raters. Moreover, the first three of these indices assume that the ratings reflect assignment to discrete categories; only the last is appropriate if one wishes to assess agreement on ratings that reflect continuous scores (e.g., composites of items or factor scores). In fact, the assumptions normally applied to Likert format ratings raise questions about the use of indices of agreement that assume discrete data unless the primary purpose of the resulting information is to assess the clarity of distinctions applied to each item category or response level.

The pairwise correlation coefficient and the Spearman-Brown estimates do not directly assess agreement. The former addresses similarities in the relative ranking of rated objects. The latter reflects the estimated stability of the score produced by averaging across raters. Both techniques can produce high estimates even when there are substantial differences in the actual ratings. Thus, each should be interpreted appropriately. The average pairwise correlation coefficient may be an extremely informative index if the researcher is asking whether different individuals used similar decision rules in applying the rating scale—a concern in studies such as the one by Cornelius and Lyness (1980). On the other hand, the information about reliability of the aggregated score provided by the Spearman-Brown formula is important for studies that use the averaged rating as a primary basis for additional analyses (Drexler, 1977; Jones & James, 1979). Still other studies may require the researcher to calculate more than one of the indices to address simultaneous questions of interrater agreement, similarity of decision rules, and reliability of the average rating.

A further caveat about the information provided by the above-cited estimates is in order. Although a primary reason for the use of multiple raters is to produce scores with increased objective accuracy, none of the indices addresses accuracy per se. Kaye pointed out that "these coefficients estimate the observers' strength of agreement with one another, not their agreement with an ideal" (1980, p. 461). Questions of this latter sort must rely primarily on demonstrated relationships between ratings and external events rather than demonstrations of internal consistency or interrater agreement.

Two other issues appear relevant, namely, the potential impact of certain distributions of the data and the apparent increase in agreement when ratings were transformed to reflect higher order dimensions. The first of these points was discussed earlier, but it should be noted again that actual agreement may be misrepresented if there is little variation on the attribute being rated. This problem is most likely to occur when standardized instruments developed to measure a wide variety of job-related conditions or behaviors are used to rate a restricted set of observations or to compare very similar jobs across organizations. For example, subordinate observations of leader behaviors within a restricted time frame or on a highly formalized procedure may yield high agreement and little behavioral variance. A similar problem may be encountered when one attempts to compare jobs in highly structured organizations in which certain characteristics are common to all jobs. In such situations, the use of a mean or a median value to summarize interrater agreement across several items may be misleading if the distributions underlying the items vary widely. For these reasons, an accurate interpretation of the indices described in the present study requires some understanding of the actual distributions of the data.

In regard to the apparent increase in agreement when items were transformed into dimension scores, a number of points must be considered. On the surface, such findings appear consistent with the argument by Cornelius and Lyness (1980) that interrater agreement will be improved when an externally administered algorithm is used to combine relatively specific ratings. Such an argument apparently suggests higher agreement for those specific ratings. Unfortunately, based on comparisons with estimates published previously, a reader probably would reject the present job element ratings for inadequate agreement but would accept the dimension scores. Which decision is correct depends largely on the ultimate uses of the data.

As Kaye (1980) noted, when observations of specific events are summed or transformed, it is not the properties of the individual events that are of concern, but rather the interpretability, meaning, and applicability of the scores that actually will be used. In fact, it may be inappropriate or misleading to calculate indices of interrater agreement for the raw data if the *primary* use of such ratings is to form a basis for item composites or transformed scores (Kaye, 1980; Repp et al., 1976). In the present study, for example, it is likely that the specificity of the item ratings introduced an artificial level of precision because such judgments required information that was presented only generally in the written descriptions. Thus, it is probable that the raters used a form of mental averaging that reduced agreement on specific items but allowed agreement at a higher level of abstraction. Such an approach may produce low levels of agreement on ratings of any specific item but higher levels of agreement on an average profile of similar items.

In summary, the present study sought to provide an empirical illustration of major concerns in the selection, interpretation, and comparison of several indices commonly used as estimates of interrater agreement. As indicated by the results of this study, the appropriateness of each index must be established on the basis of (a) the nature and distribution of the data, (b) the information sought, and (c) the appropriate level of analysis for the final scores. Such specification may require the investigator to calculate more than one of the indices described here but will provide major strides in achieving comparability across studies.

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Research Notes

URBAN GEOGRAPHIC FACTORS AND LOCATION SATISFACTION FOLLOWING A PERSONNEL TRANSFER[1]

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Employee transfers have been an integral element of the staffing and organizational development functions of countless organizations for many years. In fact, it has been estimated that, on average, more than 800,000 household heads were relocated annually during the 1973-1977 period in the United States alone (U.S. Bureau of the Census, 1975, 1979). In recent years, however, many employees have been less willing than in previous times to accept transfer directives (Dever, 1980; Miller, 1978), even though the number of transfers actually occurring in the United States has doubled since the early 1960s (Sell, 1981).

The specific reasons for the new reluctance to relocate vary, although they tend to be associated with a more general trend toward employee values of independence and quality of life (Kinkead, 1980; Schein, 1978). Accordingly, one recent study found that the reactions of mobile corporate families toward their new geographic locations were of primary importance in predicting the *overall* attitudes of those families toward their most recent transfer experiences (Pinder, 1977). Other studies have found various urban geographic dimensions such as climate, pollution, public safety, housing, and school facilities critical in the formation of attitudes toward cities and towns (Gustavus & Brown, 1977; Meyer & Leone, 1977; Rosen, 1979).

The purpose of the present study is to investigate the comparative importance of a number of objectively measured urban characteristics in predicting the location satisfaction of a sample of recently transferred corporate families.

Method

Participants. The sample was drawn from six companies in three industries in which job transfers are common: petroleum, retail sales, and transportation. Personnel managers in each of the six companies used a random sampling procedure furnished by one of the authors to select a sample of employees who had been transferred at least once. Data were collected from these individuals (most of whom were managerial, professional, or technical personnel) by means of a mailed questionnaire, returned directly to the researchers. (The employees' spouses were asked to complete a shortened version.) Participation in the survey was voluntary, and the usual promises of anonymity and confidentiality were provided. The questionnaires dealt with a variety of transfer and work related issues, as well as the usual demographic information. The data were collected from three companies in 1975 and three more in 1976.

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A total of 405 employees and their spouses (or 55 percent of the sample selected) returned usable questionnaires. It was not possible to assess whether the respondents differed systematically from the nonrespondents. Employees and their spouses were requested to complete their questionnaires independently of one another. (Copies of the instrument can be obtained by writing to the second author.)

Only the responses from those people who had moved to *and* from 19 of the 22 Canadian Census Metropolitan Areas (CMAs) were included in the sample used in this study. These data then were matched to urban geographic data available in Canadian Federal Government statistical reports (Hill, 1976; Ray, 1976; Stewart, Belgue, Bond, L'Anglais, & Turcotte, 1975). Thus, the final sample included 237 employees (95 percent male) and 198 of their spouses. The mean age of the transferred employees was 37.9 years (S.D. = 8.8) while the mean age of the spouses who responded was 36 years (S.D. = 8.7). The average length of time since their most recent transfer was 27.1 months (S.D. = 13.5). The vast majority of the families had been relocated more than once, many of them several times.

Definition of the Variables. The specific urban indices used as independent variables and the dates of their construction are listed in Table 1. Standardized responses to the following three Likert-type questionnaire items were aggregated to serve as the dependent variable:

(1) Everything considered, how well do you like your new location?

(2) Everything considered, do you prefer your new location or your old location?

(3) In general, how satisfied are you (personally) with your new location?

Correlations among the three items based on data from all respondents ranged from .72 to .84.

A number of variables were included to control for possible confounding effects. First, having previously lived in a particular location might cause a prior positive or negative affective bias toward that location. Accordingly, a questionnaire item on the respondent's prior familiarity with the new city was included. Second, organizations often compensate employees for the differences in urban amenities as well as the monetary and psychological costs of the transfer with salary increases, mortgage assistance, and other incentives. To control for this compensation, three separate regression models were constructed. The first model included only the prior familiarity item and the 15 urban indicators (Table 1), excluding economic

Table 1
Urban Characteristics and the Corresponding Index

Urban Characteristics	*Index*	*Date of Construction*
Air quality	Index of suspended particulate matter	1973
Civic participation	Voter turnout in municipal elections in the major city in CMA[a]	1969-1974
Climate	Coldness index (number of degree days below 65° F)	1971
Crime	Number of criminal code offenses per 10,000 population	1971
Cultural opportunities	Museum and art gallery floor space per 100 population	1971
Education	Ratio of people with some university education to people with grade 8 or less	1971
Ethnic diversity	$\Sigma(1/S_i)^2$ where S_i is the proportion of total population with that ethnic background	1971
Growth rate	Population growth rate over 5-year period	1966-1971
Health care	Number of hospital beds per 1,000 population	1972
Cost of housing	Ratio of the average cost of housing to the median family income	1971
Missing persons	Number of missing persons per 10,000 population	1971
Parks	Number of parks over 50 acres in the metropolitan area	1974
Police efficiency	Percentage of criminal code offenses cleared (i.e., charges laid)	1971
Population turnover	Ratio of immigrants and emigrants to total population	1971
Vacancy rate	The vacancy rate in apartments with more than 6 units	1974

[a] Canadian Census Metropolitan Area.

considerations altogether. Then, to reflect the full impact of the transfer on familial wealth, a second model was tested, adding the following item from the questionnaire: Everything considered, is your *present* standard of living higher or lower than it was before your last transfer? A 3-way response format was provided with this item, allowing the respondent to indicate whether his or her standard of living had increased, remained the same, or decreased (coded 3, 2, and 1, respectively). Finally, because the questionnaire item in the second model and the dependent variable were both perceptual in nature and thus perhaps jointly determined, a third model was developed that utilized two different but more objective measures of the economic impact of the transfer on the family: (1) the amount of pay increase that accompanied the transfer and (2) whether, as a consequence of the relocation, the spouse had gained or lost an outside source of income or had remained at the same employment status.

Both the employee and spouse samples were randomly separated into two subsamples to permit cross-validation of the results. Within the first of each of the subsamples, the independent and control variables were entered into multiple regression equations in a stepwise fashion. Those variables that contributed at least 1 percent marginal explained variance in the dependent variable were used to develop two shortened models in these same subsamples. Then, beta and constant regression coefficients from this second analysis were used to generate predicted location satisfaction scores in the two remaining subsamples. As a means of testing the predictive stability of the two models, simple Pearson correlation coefficients were computed between the predicted and the actual new location satisfaction scores in the second subsample.

Results

The results of the three shortened regression models are shown in Table 2 for the employees and in Table 3 for the employees' spouses. Comparisons among the columns in each of these tables show that the same urban variables contributed more than 1 percent to explained variance in the dependent variable, regardless of the inclusion of an economic variable.

Table 2
Regression Results Determining Locational Satisfaction—Employees[a]
($N = 121$)

	A *Urban Characteristics and Familiarity*		*B* *Including Perceptual Economic Variable (Standard of Living)*		*C* *Using Salary Increase and Change in Spouse's Employment Status*	
Variable	*b*	*F*	*b*	*F*	*b*	*F*
Prior familiarity	.973	5.09*	.909	4.43*	1.166	7.18*
Turnover	.090	5.37*	.082	4.45*	.593	2.12
Housing cost/income	.952	4.84*	.980	5.16*	1.102	6.49*
Crime rate	.0021	1.48	.0025	2.12	.0029	2.85
Standard of living	(not included)		.425	1.93	(not included)	
Salary increase	(not included)		(not included)		.265	4.35*
Constant	-6.014		-7.094		-5.65	
R^2	.245		.257		.275	
Adj R^2	.218		.225		.237	
F	9.39		7.95		7.20	
p	.00		.00		.00	
Cross-validation in second sample						
$n = 116$						
Pearson coefficient	$r = .328$		$r = .247$		$r = .284$	
Significance	$p = .000$		$p = .003$		$p = .001$	

[a] Except for "salary increase," the variables are listed in order of explained variance.

*$p < .05$

Among the employees, prior familiarity with the new city had the strongest influence on location satisfaction. The turnover rate and the ratio of housing cost to family income were the only significant urban factors (as determined by F-tests).

The results for the spouses were similar to those found in the employee data, but with some interesting differences (Table 3). The family's economic position and prior familiarity with the location were again important explanatory variables (see Model B of Table 3). But when the salary increase and spousal employment status were substituted for the perceptual standard of living variable, it was the employment status of the spouse that had the most predictive impact (Model C). As seen at the bottom of the two tables, the results for both subsamples held up under cross-validation.

Table 3
Regression Results Determining Locational Satisfaction—Spouses[a] ($N=96$)

Variable	*A* *Urban Characteristics and Familiarity*		*B* *Including Perceptual Economic Variable (Standard of Living)*		*C* *Using Salary Increase and Change in Spouse's Employment Status*	
	b	*F*	*b*	*F*	*b*	*F*
Standard of living	(not included)		1.386	10.47*	(not included)	
Spouse employment status	(not included)		(not included)		.884	1.74
Prior familiarity	1.425	6.01*	1.325	5.73*	1.22	4.17*
Missing persons	.043	3.36	.045	4.12*	.042	3.20
Voter turnout	-.109	2.64	-.116	3.30	-.121	3.20
Ethnic diversity	-4.72	1.48	-4.866	1.73	-4.95	1.63
Education	.049	2.32	.042	1.85	.041	1.57
Parks	-.041	1.40	-.036	1.16	-.046	1.73
Constant	3.535		.898		4.70	
R^2	.220		.303		.235	
Adj R^2	.168		.247		.174	
F	4.17		5.45		3.85	
p	.001		.000		.001	
Cross-validation in second sample $n=102$						
Pearson coefficient	$r=.330$		$r=.401$		$r=.346$	
Significance	$p=.000$		$p=.000$		$p=.000$	

[a] Except for "spouse employment status," the variables are listed in order of explained variance.
*$p<.05$

Discussion and Recommendations

The importance of prior familiarity in determining the locational satisfaction of both employees and spouses was as expected. Having a basic understanding of the location of stores, schools, theatres, parks, and other necessities and renewing ties with friends and acquaintances should make the settling-in process easier and less stressful, other things being equal. This reduces uncertainty and anxiety and should permit more positive attitudes toward the job, the city, and other facets of the overall transfer experience. An alternative explanation for the positive association between familiarity and location satisfaction recognizes the acceptance, rather than rejection, of the respective transfer directives by all of the respondents. A prior positive affect for a location naturally influences a person's decision to accept a relocation. Thus it may be that the sample disproportionately represents individuals whose prior experiences at their new locations were positive rather than negative.

Taken together, the urban variables suggest that employees prefer to be moved to cities that are growing and dynamic rather than static or in decline. First, their satisfaction was higher in cities with higher turnover rates. Also, higher housing costs as a percentage of income indicates the existence of job opportunities and urban amenities that attract a large work force, and this influx creates a strong demand and higher prices for housing. Intuitively, a higher crime rate should reduce one's locational satisfaction. But this is a metropolitan-wide statistic and may not be representative of the particular neighborhoods into which members of the sample moved. Rather, higher crime rates are common in growing cities, and this variable could be an additional surrogate for the dynamism dimension. The same argument can be made for the social instability index (as measured by the missing persons statistic), which was correlated with the locational satisfaction of the spouses. The positive coefficient could reflect the dynamism factor rather than direct experience with the missing persons problem per se. Finally, although the employees seemed to be concerned with their families' financial well being, the spouses showed relatively more concern for education, parks, ethnic diversity, and civic involvement (at least as reflected in the 1 percent variance criterion).

In addition to the quality of life considerations, this study points up the importance of the family's experiencing increases in their incomes or standards of living and thus permitting easier acceptance of the new city. In each subsample, an economic variable was statistically significant in one of the models and met at least the 1 percent explained variance criterion in the other. It is noted that when the economic factor was separated into the individual contributions by the employee and the spouse, the employee interpreted economic well-being in terms of his own contribution, his salary, whereas the spouse interpreted it in terms of her financial contribution. Further research could be done on the impact of transfers on dual-career families, particularly on their individual work and income circumstances.

This study examined the impact of urban characteristics on the locational satisfaction of recently transferred employees and their spouses. An implicit assumption was that the employees have accurate perceptions of the urban amenities or disamenities in their old and new locations. Ideally, one would like to know these perceptions prior to the move, because it is the employee's expectations of what he or she will find in the new city that impact, first, on the decision to accept or reject the transfer and, second, on the initial attitude toward the new location. This is an important area for future transfer policy research. However, this study can offer some insights into the post-transfer accuracy of perceptions. One section of the questionnaire asked the respondent to indicate whether he or she perceived various aspects of the new city to be better than, about equal to, or worse than the same features at the previous location. Because the respondents were surveyed before the urban data became publicly available, there was not a one-to-one mapping between the perceptual and urban variables. However, where possible, comparisons of the perceptions of differences between the cities were made with the objective differences in the values of the urban variables. The correlations for variables reflecting education, climate, crime, and cultural opportunities ranged from .15 to .46 and, although not high, all had the correct sign and were statistically significant, showing some agreement between employee perceptions and actual urban characteristics.

Metropolitan-wide data were used in this study because these were the most disaggregated data available, but people are more concerned with factors such as crime, parks, housing costs, and schooling in their own neighborhood rather than over the greater metropolitan area. Data disaggregated to the neighborhood level would be preferable in future research, although they too pose serious definitional problems. For example, the relevant comparison area for some factors, such as schooling, may be the immediate neighborhood, whereas for crime the person's own neighborhood as well as the area around the workplace and along the routes between the two may be more important. For parks and other public amenities, a city-wide perspective may be most appropriate.

Finally, data on a number of potentially important variables were not available for inclusion in this study. Future investigations into the relative importance of urban amenities and disamenities should include, if possible, transportation-oriented data such as travel time to work or a congestion cost index as well as measures of the overall cost of living.

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MANAGERIAL STRATEGIES IN MUNICIPAL GOVERNMENT ORGANIZATIONS[1]

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The contraction of the public sector is thoroughly chronicled by scholars and practitioners in the management and organization theory literature. However, the need to provide systematic evidence concerning the managerial responses to this decline has not been met (Ansoff & Hayes, 1976; Fottler, 1981; Levine, 1978; Lyles & Mitroff, 1980; Murray & Jick, 1981; Stanley, 1981; Steiner & Miner, 1977; Ungson, Braunstein, & Hall, 1981). There are several competing contextual issues, such as the acceptability of a general theory of public administration or management strategy, but the objectives of this exploratory study are to examine certain dimensions of managerial strategies in local government and provide a basis for further conceptual and empirical development.

There is a need for public administration, organization, and management theory to address, systematically, important aspects of public managerial strategies in cases in which the potential impact of these strategies has significant human and long term economic implications. Ungson et al. (1981) showed that theories of organization design are not explicit about how decision making occurs in ill-structured situations with multiple problems. Lyles and Mitroff (1980) also demonstrated that strategic decisions in organizations are little understood and require empirical examination to identify relevant factors.

Ansoff and Hayes (1976) and Steiner and Miner (1977) focused on the theory associated with management strategy and strategic management, but they also emphasized the need for redirection and generalized approaches to system strategies in situations in which the strategic management problem is one of the "most startling challenges" for profit and nonprofit organizations. Also, Steiner and Miner recognized that "government is the most dominant institution in society" for which the strategy processes may literally mean "the difference between life and death to all of our institutions and to each of us personally" (1977, p. 296).

Levine (1978) categorized certain causes of public organization decline and delineated types of objectives. He further described a set of tactics that are or may be used to smooth and/or resist decline along external and internal political and economic-technical dimensions. Another more recent attempt to circumscribe the problem of strategic decisions and managerial responses in public sector organizations was presented by Murray and Jick (1981). Because Murray and Jick (1981) presented their conceptual approach only recently, one understandable omission in the literature is that there has been no empirical test of their model, or for that matter any others. They argue correctly that:

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[1] This study is based on data collected as part of a larger project dealing with management in local governments and supported by Organized Research Funds from Pennsylvania State University. Portions of this report have been reported in the 1982 *Academy of Management Proceedings*.

> Until a clearer understanding is obtained of the variables and processes shaping strategic decision responses to cutbacks no significant progress can be made toward the next step of developing prescriptive advice on how threatened organizations ought to be managed in the coming years of "hard times" (1981, p. 343).

Approach and Method

The specific research questions to be investigated in this study are: (1) Are there identifiable dimensions of management strategies? (2) What are the research and practical implications of the findings? Factor analysis will be used to determine if dimensions or patterns of variables exist in the managerial responses to 25 decision alternatives.

Although the Murray and Jick (1981) model is rich in detail and in specifying conditions and determinants of various public sector strategies, the intent in this study is to emphasize only those facets associated with managerial strategies. Management strategy in government organizations is still an underresearched topic. Thus this study design is an exploratory approach to empirical verification that attempts to improve theoretical understanding of the organizational variables and to refine research issues in the realm of managerial strategic decisions.

The data to be used in examining the research questions were collected from mayors and managers of 167 local governments in Pennsylvania with a population over 10,000 to reduce the heterogeneity of the influences affecting very small municipalities. [See the *Municipal Yearbook 1980* (International City Management Association, 1980).] Questionnaires on managerial strategies to deal with problems faced by municipalities were sent to these 167 mayors and managers as part of a continuing project on local government management. Returned were 90 usable questionnaires, for a response rate of approximately 54 percent. The respondents are representative of the managers of local governments over 10,000.

As shown in relevant and recent literature (Danziger & Ring, 1982; Levine, Rubin, & Wolohojian, 1982; Plant & White, 1982; Stanley, 1980), there is a convergence in thinking about potential strategies that local managers are pursuing and may pursue to deal with current cutback problems. These related efforts (local, state and federal government produced documents/literature) and findings from previous research with these same governments (this study is a follow-up to data derived from an immediately preceding study) were used to compile a representative set of strategies that were being used and were being evaluated for use by the managers and mayors. These ongoing and potential actions were not used by all the respondents or considered to be exhaustive; however, based on the pertinent literature and the antecedent study, they did represent a targeted, systematic assessment of the activities and needs of the focal organizations. Further, the respondents were asked to contribute strategies that were not represented in the questionnaire, but no important additions were made. The managers and mayors were asked to assess their agreement with each of the 25 strategy alternatives in terms of their applicability to the situation confronting the municipality. This agreement was rated on a (1) strongly disagree to (5) strongly agree scale. The substance of each of the 25 alternatives is presented with each variable used in Table 1.

Results

Table 1 presents the results of the factor analysis with varimax rotation for the managerial actions to be used in dealing with the problems. The factor loadings show that no clear external-internal dichotomy was found. Factor 1, which accounts for approximately 22 percent of the variation, represents a resource-seeking strategy that focuses on external actions or sources of revenue if the local government is adopted as the focal organization. One of the dominant needs of government is to increase revenue, and factor 1 clearly identifies the state and federal governments as potential sources of revenue. This strategy may have short term payoffs for the managers, but the prospects for the future are that state and federal governments also will experience resource/revenue constraints.

Factor 2, compromise existing authority and financial position, is composed of trading off local controls, default, and bankruptcy variables. This dimension reflects a reactive or acquiescent strategy that compromises local autonomy and financial standing. If local control is traded off for more centralized decision making or control at the state level and the financial position of the government is jeopardized, the ability of local government to manage effectively the provision of primarily local services is seriously threatened.

Factor 3 represents an elaboration of the first factor because of its basic revenue focus. In addition to external revenue sources, managers are required to balance expenditures with internal sources of revenue such as tax or nontax (user fees, charges, etc.). Increasing internal revenues as a strategy has some advantages because it relates cost of the service to the benefits for the managers; however, tax limitation initiatives are growing in number and scope. Local taxes also are constrained by state laws. This means that user fees and revenues will have to absorb more of the increases, but they constitute only a minor source of revenue in relation to the taxes. This factor shows that the managers recognize the potential for increasing internal revenues, but the managers will have to evaluate the trade-offs in pursuing this strategy.

As shown with factor 4, another potential strategy for management is to seek additional state aid and authority. Because the local government

Table 1
Results of Factor Analysis to Assess Dimensions of Management Strategy (Varimax Rotation)[a]

Variable	*1* *Seek External Revenue*	*2* *Compromise Existing Authority and Financial Position*	*3* *Increase Internal Revenue*	*4* *Seek Additional State Aid and Authority*	*5* *State Pays High Cost Items*	*6* *Cut Safety and Human Services*
Sell short term notes	.13	.07	.02	-.04	.12	.06
Increase tax revenue	.06	.00	.83	-.03	.03	-.06
Increase nontax revenue	.02	-.10	.61	.03	-.04	-.03
Cut human services	-.11	-.11	-.10	-.03	.02	.61
Lay off police and fire personnel	-.08	.03	.02	.14	-.03	.67
Stop capital expenditures	-.02	.08	-.02	-.14	-.06	.17
Seek grants from state government	.85	.03	.04	.05	.06	-.07
Seek grants from federal government	.97	.05	.02	.02	-.06	-.09
Seek increased tax authority from state	-.06	.13	.11	.00	-.10	-.03
Seek annexing authority	-.02	.12	-.03	.71	-.02	.09
Seek guarantees of loans	.16	-.15	.13	.41	.23	-.02
Promote regional governments	.16	.15	.02	.52	.29	.02
Stricter budgeting/accounting	.10	.01	.03	-.04	.08	-.02
Default on securities	.09	.68	-.03	-.08	.07	-.11
Trade-off local control	.06	.78	.02	.22	.09	-.06
Declare bankruptcy	-.07	.56	-.10	.11	.18	.04
Reduce state mandates	-.03	.08	.01	.19	.19	.13
Increase debt ceiling	-.03	.23	.18	-.11	-.08	-.04
Give tax breaks for economic development	.13	.04	.28	.26	.01	.01
Improve productivity	.23	-.04	.03	.02	-.02	.31
Contract out for services	.11	-.07	-.07	.06	.21	.26
Decrease worker wages/benefits	.08	.19	-.17	-.09	-.12	.04
Have state provide costly services	.08	.21	.06	.02	.88	.08
State pay local pension costs	-.06	.04	-.07	.07	.41	-.05
Revise Act 511 (tax law)	-.03	.17	.34	.34	-.16	.01
Eigenvalue	2.77	1.89	1.52	1.50	1.42	1.03
Percent of variation accounted for	21.5	14.6	11.8	11.6	11.0	8.0

[a] Items characterizing a factor (factor loading greater than .40) are underlined.

manager is primarily controlled by statutory and legal mandates, a major external variable to focus on is state authority. As factor 4 demonstrates, this authority may extend to annexation of surrounding jurisdictions or the establishment of cooperative relationships with other local governments to promote regional governments, presumably to exert more influence over other jurisdictions or the state. Factor 4 also implies a cooptative stance toward the state because it includes a move to have the state guarantee loans that primarily would benefit the local manager in the short and long run.

A major pressure on government managers at the local level is the cost of pensions and public safety. Factor 5 represents a strategy that would shift high cost items such as pensions to the state level. Many local services and pensions are mandated by state authority, and usually are not fully reimbursed. This strategy therefore would alleviate a high visibility and long term cost problem. One problem is that the state does not have better revenue generating capabilities, and the shift would not have a high probability of occurring. The strategy then may not have the desired payoff and would necessitate further actions to deal with the high cost services and pensions.

Cutting safety and human services is the management strategy represented by factor 6. This dimension is oriented towards internal activities and services that commonly consume the largest proportion of government resources. This strategy focuses on those services over which the managers appear to have the most control, even though various constituencies exert influence or have interest in the services. Compared to the external revenue factors, this dimension represents an efficiency perspective that can be used to improve internal operations. By itself, it is not sufficient to deal with the major system variables such as state or federal authority, but it is a necessary strategy for controlling important internal costs.

Taken together, the results of the factor analysis suggest that there are multiple external and internal strategic foci for the mayors and managers. The findings appear to represent a combination of strategies rather than single approaches to decision making. That is, the factors suggest that internal and external actions are interrelated (Fottler, 1981). For example, high levels of unemployment or other economic conditions, not under control by the mayors-managers, may lead to external and internal revenue seeking or internal actions such as service cuts or layoffs. Further, mandates from higher levels of government may require increased expenditures and thereby exert pressure for additional internal and external revenue seeking.

The findings from the factor analysis indicate that the external system is perceived as a purposeful task domain. For instance, if budget deficits are perceived to be a function of declining revenues from external sources such as the state or federal government, or are based on state or federal mandates/authority, then the logical strategy for the managers is to seek those resources. In addition, some internal expenditures may be out of control because of macroeconomic influences, unions, or past federal and state spending habits that created rising expectations for government services.

An interesting direction for subsequent research in public management would be to examine the control that government managers actually have over various elements in their strategic environments.

Because factor analysis is a data reduction technique that serves parsimonious explanations well, and because only factors with an acceptable eigenvalue of 1 or better were presented here, these six factors cannot be considered exhaustive. For these mayors and managers, the factors represent major dimensions or patterns of decision responses. Because there has been no reported empirical work addressing similar concerns, these results indicate that the basic patterns found reflect a theoretical construct that provides a basis for further exploratory work and subsequent testing of theoretical propositions.

Discussion

Patterns of Strategies. The purpose of this exploratory study was to examine whether patterns of management strategy existed in local government organizations. The results of the factor analysis suggested that specific dimensions of strategy do exist, because the factor analysis of the alternative management actions produced a differentiated picture of local government management strategies that combined internal and external elements.

In ill-structured and turbulent problem situations, such as those facing local government managers, no partial or overly general model is likely to capture the impact of multiple influences. The environment of the government managers is composed of the federal and state governments, constituents, clients, and other governments for which a single or categorical strategy is not adequate. The contingencies facing government managers dictate an overall strategic posture containing elements that correspond to the requirements of each subenvironment.

Private and Government Sector Strategies. Although the focus of this study is on local government organizations, there are interesting parallels with recent findings related to private sector strategies. For example, Miles (1982) examined the strategic management of the "Big Six" tobacco firms using an adaptation typology of domain defense, domain offense, domain choice flexibility, domain creation, and other variables in a general model of organizational adaptation. These modes of response can be used to contrast the private sector with the findings presented here. Miles found the domain defense strategy to be flexible in the private sector and observed that actions such as joint ventures with other companies could be pursued. In comparison, a government organization is more constrained by a statutory framework that explicitly limits the legal boundaries of the domain, especially at the local level. Although some federal laws are more open to interpretation by chief executives or agency heads than others, the pursuit of major changes requires higher level authority changes that usually are more extensive than those needed for private sector initiatives.

Corporations also may pursue domain offense strategies such as expanding market shares, but a parallel move in government (for example, annexing other jurisdictions) requires external state authority and multiple layers of justification in the case of these local governments. Private sector organizations also may try to create domains through diversification or overseas expansion, whereas government organizations cannot expand their revenue base (increase taxes or nontax revenue) as easily because of the political and economic constituencies that translate into authority and/or make demands on the governments for services.

When the domain defense, offense, and creation typology is used to compare the private and government sectors, it can be seen that both exist in a broad type of political-economic (authority-political-economic/budgetary for government organizations) milieu. However, local government organizations have much less domain choice flexibility in altering their objectives, controlling their sources of revenues, changing their "leaders," managing their personnel, or changing their political-economic environment. This inflexibility then creates certain imperatives for the internal effectiveness of the local governments. In an uncertain, multiple objective, multiple constituency, economically constrained environment with little organization slack (Fottler, 1981; Miles, 1982), it would appear that government management and decision making offer less potential for timely adaptation and strategic change than is possible for private management. Of course, many of these issues require further empirical verification and elaboration to test specific propositions.

Conclusions and Implications

The emergent conclusion from this study of local government managers and mayors is that their overarching strategic posture can be characterized as a set of dimensions in need of integration. The pattern of the factors appears to be based on a risk-averse approach (Feller, 1981). Although follow-on research is required, these tentative conclusions suggest that the patterns of strategies found here correspond to incremental models of management strategy. The exploratory research results have limitations, such as a focus on a particular level of government in one state during a period of turbulence; however, they provide an empirical foundation for further conceptual development and hypothesis specification across other levels of government and management in other periods. A comprehensive or systematic theory of government organizations, management, and strategy will have to rely on contributions from additional studies to build a more comprehensive approach to understanding governmental organizations and management strategies.

The implication of the findings for practitioners is that managerial strategies have to be developed by analyzing specific contingencies, external and internal demands, and the interdependence between them. Practitioners also may need operational mechanisms for defining governmental objectives so that strategies for achieving them can be developed. Researchers need a clearer understanding of government organizations generally and the most salient conditions affecting their management strategies. Questions concerning management incentives, governmental performance measures, organizational objectives, and organizational-program effectiveness are all related to what management strategies can be considered optimal. A sound first step would be to outline the central elements of a public organization theory.

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WHEN REASON FAILS: A COMMENT ON THE RELIABILITY AND DIMENSIONALITY OF THE WAMS[1]

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Crino, White, and DeSanctis (1981) recently questioned the reliability and dimensionality of the Women as Managers Scale (WAMS). They reported data purported to indicate "the possibility of differential subgroup reliability and dimensionality for the WAMS" (1981, p. 866). It is contended here that although these authors' position may indeed be correct, the data that they offer lead to exactly the opposite conclusion about the scale's reliability and cannot speak to its dimensionality.

In order to understand the weaknesses of the arguments presented by Crino et al., it is necessary to look at their data set. Two relatively large samples were drawn from two populations—students and managers. The response rate in the student sample was excellent (90 percent to 95 percent) and was very reasonable in the managerial sample (58 percent). Both samples were administered the WAMS along with several other scales, and analyses were reported for the several subgroups and aggregations. Three sets of samples—males only, females only, and combined across sex—were created within the student sample, within the management sample, and for the total sample. Table 1 presents the data most relevant to the arguments to be made here. It is believed that the data of Crino et al. not included in Table 1 do not contradict the position taken in the present paper.

Reliability

Crino et al. reach the following conclusions about the scale's reliability:

> [The] data indicate that the WAMS may be a more reliable ($\alpha < .05$) measure for students than for managers. Similarly, the instrument appears to be more reliable for males than for females both within and across samples (1981, p. 868).
>
> ...instrument reliability estimates for males and females within and across both samples...differ when compared at conventional levels of significance ($\alpha = .05$). Depending on the researcher's purpose..., this differential reliability may require slightly different attenuation corrections for different groups (1981, pp. 870, 872).

The implications to be drawn from the authors' discussions of the scale's reliability are that its reliability may vary across subgroups and that these differences may be problematic for those using the scale. To the authors' credit, they do imply that the effects may be "slight," but not until it is realized how slight these effects are does it become apparent that there really

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[1] The authors wish to thank P. Schönemann for his comments on an earlier draft of this paper.

Table 1
Eigenvalues and Sample Characteristics for Crino et al.'s (1981) Data[a]

	Student Sample				*Manager Sample*			
	Males		*Females*		*Males*		*Females*	
Sample size	*654*		*350*		*200*		*396*	
Mean	*103.10*		*129.65*		*111.26*		*128.36*	
Standard deviation	*18.66*		*12.51*		*20.79*		*15.02*	
Corrected split-half reliability	*.91*		*.85*		*.93*		*.86*	
Component	*Eigenvalues*	*Cumulative %*	*Eigenvalues*	*Cumulative %*	*Eigenvalues*	*Cumulative %*	*Eigenvalues*	*Cumulative %*
1	7.13	34.0	5.25	25.0	8.44	40.2	5.86	27.9
2	1.43	40.8	2.00	34.6	1.57	47.7	1.96	37.3
3	1.32	47.1	1.52	41.8	1.32	54.1	1.45	44.2
4	.99	51.9	1.18	47.4	.96	58.7	1.26	50.2
5	.96	56.5	1.07	52.6	.90	63.0	1.12	55.6
6	.80	60.3	.98	57.3	.86	67.1	1.01	60.4
7	.78	64.0	.90	61.6	.81	71.0	.93	64.8
8	.75	76.6	.85	65.6	.66	74.2	.75	68.4
9	.71	71.0	.84	69.7	.64	77.2	.73	71.9
10	.68	74.3	.83	73.6	.58	80.0	.72	75.4
11	.66	77.5	.75	77.3	.55	82.7	.71	78.8
12	.63	80.5	.66	80.4	.51	85.1	.62	81.7
13	.61	83.4	.61	83.3	.49	87.5	.59	84.6
14	.54	86.0	.58	86.1	.46	89.7	.56	87.2
15	.51	88.5	.55	88.8	.44	91.8	.51	89.7
16	.49	90.8	.49	91.2	.38	93.6	.48	92.0
17	.47	93.1	.44	93.3	.35	95.3	.41	94.0
18	.42	95.1	.41	95.3	.29	96.7	.38	95.8
19	.39	97.0	.37	97.1	.28	98.1	.36	97.5
20	.34	98.6	.35	98.8	.23	99.2	.27	98.8
21	.28	100.0	.25	100.0	.17	100.0	.25	100.0

[a] Underline indicates the component solution recommended by Crino et al. (1981).

is little or no value in raising the issue in the first place—at least not based on the Crino et al. data.

One way to explore the practical value of the differences in the reliabilities between samples is to compare correlations that have been corrected for attenuation based on different scale reliabilities. To do this, the present authors selected the two most extreme reliabilities in the subgroups of the data under discussion—.85 for female managers and .93 for male students. (One combination of the data—that based on collapsing across sex in the student sample—had a more extreme reliability—.94. This was not presented here because that combination of the data was not represented in Table 1. However, when examples with the same conditions are corrected as above using .94, there is no change in the range of corrected correlations when those for .94 are compared to those with .85.) The effect of the correction for attentuation on four selected examples then was considered. The first example was a moderate correlation ($r=.40$) between a scale such as the WAMS and some criterion. The second was a moderately high correlation between an attitude scale and some criterion—$r=.60$. Next considered was one condition for which there was a perfectly reliable criterion and another for which the reliability was minimal—.80. These data are presented in Table 2. In no case did the difference in the correlations corrected for attenuation differ more than .03 correlation units. Certainly there is agreement with Crino et al. that such differences in corrections for attenuation are "slight," and there appears to be little cause for alarm.

Table 2
Examples of Corrections for Attenuation for Selected WAMS Reliabilities and Hypothetical Criterion Reliabilities

Hypothetical Criterion Reliabilities	*.80*		*1.00*	
Reliabilities of WAMS for Two Observed Samples[a]	*.85*[b]	*.93*[c]	*.85*[b]	*.93*[c]
Example correlations to be corrected for attenuation:				
$r=.40$	.49	.46	.43	.41
$r=.60$	.73	.70	.65	.62

[a] Both sample statistics reported by Crino et al. (1981).
[b] $r_{tt}=.85$ for a sample of female managers on WAMS.
[c] $r_{tt}=.93$ for sample of male students on WAMS.

One reason that the authors may have been misled with respect to the importance of their observed differences in reliabilities is that the relatively large sample sizes in their research led to very small confidence intervals around the reliability coefficients. Although high power in a design is very valuable if one is interested in detecting differences existing between populations when the actual differences are small, the higher power can lead to detecting differences that have very little practical significance.

Regardless of the reasons for the conclusions of Crino et al. with respect to the reliability of the WAMS across subgroups, on the basis of the data they present, it seems clear that reliability issues are not problematic. A large number of statistical "tests" simply are not needed when the reliability coefficients do not drop below .85 in any condition.

Dimensionality

With respect to the dimensionality of the WAMS, Crino et al. question the factor analytic results of Peters, Terborg, and Taynor (1974) on the basis of the noncongruence in factor structures when managerial and female subsamples were compared to the total sample of either study. The lack of correspondence leads Crino et al. to question seriously the use of the scale as a unidimensional attitude measure, as was done by Garland and Price (1977) and Terborg and Ilgen (1975). They conclude that "principal components analyses indicate that although there often is one dominant dimension, there also are from two to five minor components, depending on the characteristics of the sample" (1981, p. 875). They base this conclusion on Kaiser's criterion of eigenvalues greater than 1 for determining the number of dimensions to solutions in factor analysis. The present authors also question the Peters et al. (1974) conclusion of three factors but prefer the conclusion that there are less (one), not more, factors in the scale.

The most glaring problem with Crino et al.'s conclusions about the number of dimensions in the scale is that component analysis is inappropriate for exploring the number of underlying dimensions in a data set. It is well established in principal component analysis that, for each eigenvalue in a sample that is greater than zero, there exists, with a *probability of 1.0*, a dimension in the population for that eigenvalue (Kendall, 1961). Thus, with principal components there is no test for the number of components in the data set. There is no need for one. All one has to do is observe the number of nonzero eigenvalues. Because all of the items of the WAMS have eigenvalues greater than zero in the samples used by Crino et al. (see Table 1), the dimensionality of the scale cannot be reduced. Although it is possible to test whether components in some subset are not equal to each other, whether some ordered subset from *k* to *n* is equal to zero (where *n* equals the total number of variables entered into the components analysis and *k* represents the *k*th variable when the variables are in descending order of their eigenvalues) is a meaningless question to ask with component analysis. The more appropriate analysis for addressing the number of dimensions is factor analysis. However, even this is of dubious value for discovering the dimensions of any scale. At one level, Crino et al. recognized that the decision about the number of common factors does not have a straightforward statistical solution. At a much more important level, the problem of indeterminacy in factor analysis severely questions the whole procedure for discovering the "true" underlying dimensions. One must be extremely wary of this statistical legerdemain that the computer age has made so available to all. (See, for example, Schönemann, 1981, and Steiger and Schönemann, 1978, for a delightful and enlightening discussion of the factor indeterminacy problem.)

As is the case with the issue of reliability, the number of factors issue does not need complicated statistical analyses. When the split-half reliability coefficients are .85 or greater (assuming that the items on the WAMS were randomly arranged with respect to content) it seems to be of little value to go searching for more than one dimension. Certainly, if in that search one finds six factors, as was the case for the female managers, a little common sense seems in order. One should ask, does it really seem reasonable to construct 6 uncorrelated dimensions from a set of 21 items that yielded an average reliability coefficient of at least .85? A much more efficacious strategy would be to apply another reliability estimate, such as coefficient alpha, which more directly reflects the unidimensionality of the scale.

Conclusion

There are many reasons for questioning the wisdom of using the WAMS as a measure of attitudes toward women as managers. Certainly the psychometric properties of the scale, in particular its validity, were little more than minimally acceptable in the research reported by Terborg, Peters, Ilgen, and Smith (1977). Additionally, although the scale served a useful purpose when it was developed in the mid-1970s, conditions have changed since that time. It now may be more difficult to detect subtle differences in attitudes toward women managers. These are only two of the possible reasons that the scale may have outlived its usefulness.

Regardless of the possible weaknesses of the scale, the data of Crino et al. (1981) do little to highlight them. (Crino et al. do raise one potentially important point on an issue unrelated to reliability or dimensionality. This deals with the possibility of a lack of homogeneity of variance between male and female subsamples. The potential problem is particularly relevant because responses to the scale tend to be skewed in female samples—see, for example, Peters et al., 1974. Extra effort should be made to obtain equal sized samples when comparing subgroups using the scale in order to minimize possible problems due to homogeneity of variance.) Their conclusions about the scale's differential reliability are unconvincing; certainly the differences observed are of little practical value. With respect to the multidimensionality of the scale, the data reported offer little support for concluding that several dimensions are being measured by the scales. Certainly, one will not go too far wrong by assuming that the WAMS has acceptable reliability in male as well as female samples and that the scale is predominantly unidimensional.

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NOTE ON TENSION DISCHARGE RATE AS AN EMPLOYEE HEALTH STATUS PREDICTOR

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With the increasing managerial and research interest in the topic of occupational stress has come an awareness of and concern for stress related negative health outcomes (Caplan & Jones, 1975; Harrison, 1978; Ivancevich & Matteson, 1980; Matteson & Ivancevich, 1979). The issue is not one of whether stress is related to dysfunctional health consequences, but rather how extensive is the relationship (Selye, 1976). This concern is both humanitarian in nature and very practical: employee health problems cost money in the form of increased absenteeism, health insurance costs, and performance degradation. Conservative estimates of stress-related costs are placed at $100 billion annually (Freudenberger, 1980; Rosch, 1981).

It thus is of interest when an instrument is developed that shows promise in identifying those individuals who may incur health problems as at least a partial consequence of job-related stress or tension. This type of scale would be especially useful to managers concerned with (1) maintaining a healthy, productive workforce, (2) high health care costs in the form of increased insurance premiums, disability payments, increasing health related absenteeism and turnover, and (3) matching employees and jobs in a manner that minimizes the disruptive stress reactions. One such instrument that has shown promise as a predictor of psychological and physical illness is a 6-item scale developed by Rose and his colleagues (Rose, Jenkins, & Hurst, 1978) for use in the stress and health change study of air traffic controllers. This scale, labeled tension discharge rate (TDR), purports to measure the rate at which an individual dissipates job-related tension. The underlying assumption is that people who are able to leave job tensions quickly behind at the end of a work day will be healthier than those who bring their psychological baggage home with them from the job and dwell on it.

In addition to being predictive of health status in the air traffic controller study, TDR demonstrated substantial correlations with several personality traits, the Jenkins activity survey, a self-report measure of the coronary prone behavior pattern (Jenkins, Rosenman, & Friedman, 1967), and a number of life change events. Because of its ability to discriminate among a number of health, personality, and life factors and because it is short, easy to complete, and nonthreatening to respondents, it has significant potential appeal as a research and diagnostic instrument. To examine whether TDR possesses external validity and can be used with samples other than male air traffic controllers, it was included in a group of instruments used to study a predominantly female sample of medical technologists. The study was concerned primarily with examining stress and health variables among medical technologists (Matteson & Ivancevich, 1982).

The TDR scale uses a 7-point response format ranging from completely false to completely true. The scale, as used in the study reported here, contains the following six items.

1. After I leave work for the day, I continue thinking about all the problems and go through them again in my mind.
2. I stay in "high gear" and have trouble relaxing once I leave work.
3. Over the past few months, I find it is becoming increasingly difficult to unwind at the end of my work day.
4. When I get home after work, I am so preoccupied with what happened on the job that I can't talk with my spouse or friends.
5. Even when I'm away from the job, I spend much of my time thinking about my work.
6. In describing me, my friends would say that I eat, drink, and think medical technology.

The only previous research examining the psychometric properties of this scale yielded a coefficient alpha of .82 and a 9-month test-retest reliability of .67 (Rose et al., 1978). The coefficient alpha for the present study was .88.

Work stress may be thought of as the result of the interaction between the individual and the work environment. At the end of a work day some people are able to "protectively adapt or cope" (Lazarus, 1966). The adaptive person is able to release tensions created by the stress at work in an efficient manner, but nonadaptive persons have difficulty releasing tensions. Nonadaptive coping may result in apathy, depression, or, in the extreme, suicidal behavior (Troll, 1975). The TDR scales may provide data concerning the individual's effectiveness in adapting through dissipating tension.

Method

Initially 682 medical technologists who had indicated an interest in participating in a research study completed one round of data collection. These individuals had responded to an invitation appearing in the *American Journal of Medical Technology*. TDR and other self-report data were collected from the 388 medical technologists (86 percent female) who participated in both the first and the second rounds of data collection. A total of eight measures were tested against TDR scores. TDR scores were collected during the first round. The other eight measures were collected during the second round, approximately six months later.

The eight criterion measures were: TOTP, the total number of health problems the respondent had experienced in the previous six months from a list of 28 (e.g., headaches, insomnia, ulcer, tic, nervous exhaustion); ILLH, the number of work days missed for health reasons during the last six months; BPAR, the number of days in the last six months the respondent did not perform up to par because of not feeling well (coded 1 = none, 2 = 1-2, 3 = 2, 4 = 3, 5 = 4 or more); DOCV, the number of visits a person made to a physician during the year; and ASPR, TRNQ, CIGS, and ALCO—indicators of aspirin (1 = none, 2 = 1-2, 3 = 3-5, 4 = 6-8, 5 = 9 or more per week), tranquilizers (1 = none, 2 = 1-2, 3 = 3-4, 4 = 5-6, 5 = 7 or more per week), cigarettes (1 = none, 2 = 1-10, 3 = 11-20, 4 = 21-30, 5 = over 30 per day), and alcohol consumption (1 = none, 2 = less than 1, 3 = 1-2, 4 = 3-4, 5 = 5 or more drinks per day), respectively, during the last six months.

TDR scores can range in value from 6 to 42. Scores at the median were divided to form two groups: a rapid tension release group (scores below 24), which was composed of individuals who generally indicated that the six TDR items did not apply to them ($N = 259$); and a slow tension release group (scores above 24), those who indicated agreement with the items ($N = 129$). The rapid group includes individuals who are able to adapt to job stress after the work day is completed. The slow group includes those who are nonadaptive.

The relationships among the eight criterion samples for the entire sample are presented in Table 1. Because a number of the intercorrelations were of moderate magnitude, a MANOVA design was used. A significant F ratio for the interaction term was found. This indicates that the two groups differed with respect to at least one of the criterion variables.

Following the utilization of the MANOVA, univariate F tests (ANOVA) and discriminant analysis were employed to determine which of the criterion variables were different in the rapid versus slow tension discharge rate comparisons (Borgen & Seling, 1978).

The ANOVA results, shown in Table 2, indicate significant differences between the rapid tension discharge rate participants on six of the eight criterion variables. Only for cigarettes and alcohol were the differences not statistically significant. In all six significant differences, the rapid tension

Table 1
Intercorrelations: Criterion Variables

Criterion Variable[a]	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1. TOTP	—						
2. ILLH	.29	—					
3. BPAR	.34	.56	—				
4. DOCV	.17	.35	.39	—			
5. ASPR	.22	.18	.21	.16	—		
6. TRNQ	.16	.20	.07	.18	.18	—	
7. CIGS	.00	.09	.10	.02	.09	.09	—
8. ALCO	.08	.02	.05	.01	.07	.07	.12

[a] TOTP—total number of health problems; ILLH—number of work days missed for health reasons; BPAR—number of days not performing well because of not feeling well; DOCV—number of visits to doctor; ASPR—number of aspirins per week; TRNQ—number of tranquilizers per week; CIGS—number of cigarettes per day; ALCO—number of drinks per day (alcohol).

Table 2
Differences Between Fast and Slow TDR Groups on Criterion Variables

Criterion Variable[a]	*Rapid TDR (N=259)*		*Slow TDR (N=129)*		*F Value*	*Significance Level*
	$\bar{x}$	*s.d.*	$\bar{x}$	*s.d.*		
TOTP	13.33	5.64	17.72	5.20	54.89	.000
ILLH	1.51	.67	1.72	.75	7.28	.01
BPAR	2.24	1.26	3.12	1.68	33.23	.000
DOCV	2.07	1.47	2.57	1.90	8.37	.005
ASPR	2.05	1.39	2.84	1.68	24.09	.000
TRNQ	1.11	.65	1.30	1.04	4.80	.05
CIGS	1.52	1.12	1.71	1.30	2.16	N.S.
ALCO	2.11	1.04	2.26	1.22	1.61	N.S.

[a] See footnote a, Table 1.

discharge rate participants had better scores (e.g., fewer health problems, fewer work days missed for health reasons, fewer doctor visitations).

Table 3 contains the discriminant structure matrix for the eight criterion measures utilized in the discriminant equation. The matrix consists of

Table 3
Structure Matrix of the Two-Group Discriminant Function Analysis

Criterion Variables[a]	*Function 1*
TOTP	.62
ILLH	.03
BPAR	.46
DOCV	−.07
ASPR	.25
TRNQ	.16
CIGS	.08
ALCO	.11

[a] See footnote a, Table 1.

correlations of each of the dependent measures with the discriminant function composite score vector and indicates the relationship of each of the measures utilized in the analyses to the discriminant function.

The total discriminatory power of the discriminant function analysis, calculated by using multivariate approximation to ω^2 developed by Tatsuoka (1970), was 62 percent. The function was significant ($p < .01$). Interpretation of function 1 in Table 3 suggests that the maximal differentiation among the groups on the criterion revolves around positive findings on TOTP (.62) and BPAR (.46).

Thus the ANOVA results and the discriminant function analysis results suggest that the tension discharge rate predicted the total number of health problems (TOTP) and the days the person did not feel well (BPAR). Because health problems have been linked to reduced productivity, increased absenteeism, and increased health care and disability costs, these findings are to be noted.

Results and Discussion

Consistent findings were obtained in the present study when using three analytical procedures—MANOVA, ANOVA, and discriminant function analyses. In general, the findings indicate that the slow TDR group experienced a greater total number of health complaints, missed more work for health related reasons, had their work performance impaired more frequently because of feeling poorly, and visited their physician more often. The slow TDR group also had significantly higher scores on the SSPS and reported greater aspirin and tranquilizer use than did their rapid TDR counterparts. Differences in cigarette and alcohol consumption, although in the anticipated direction, were not significant. (Although the sample was predominantly female, 54 males were included. Sex did not account for any differences.)

The findings on both predominantly male (air traffic controllers) and female (medical technologists) samples are properly viewed as tentative and incomplete, but they seem to justify additional organizational research with the scale. For example, in spite of its label, it is not entirely clear what TDR is measuring. It may be simply a measure of perceived total work stress. On the other hand, it may be a much subtler measure of an important adaptive or coping attribute related to the ability to dissipate tension efficiently—tension that otherwise would remain with the individual and be a contributor to various negative outcomes.

The relationship between job performance and TDR scores—if any—is unknown. This is a potentially fruitful area of inquiry, especially as managers search for methods to improve individual job performance and productivity. Do high performers have slower or more rapid tension discharge rates than low performers? Do changes in TDR precede changes in performance? Other areas of management concern, such as absenteeism, turnover, and accident frequency, could be examined in terms of TDR. Also, with regard to job satisfaction and quality of work life, some important managerial concerns can be investigated. A number of possibilities exist, all speculative at this point. Yet, based on the utility the measure has displayed in two different studies thus far, TDR would appear to warrant further investigation both as a research instrument and as a potential managerial diagnostic device.

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SPAN OF MANAGEMENT RESEARCH AND ISSUES[1]

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The span of management has been a widely discussed topic, especially in introductory management textbooks. However, although it is widely discussed, there appears to be little agreement among research findings with regard to factors that affect the span. Numerous explanations for that lack of agreement have been proffered (Ouchi & Dowling, 1974; Van Fleet, 1974). It has even been hypothesized that a more useful conceptualization would be that such factors directly impact on supervisory effectiveness and group productivity rather than on the span (Van Fleet, 1978). More recently, Dewar and Simet (1981) reported research suggesting yet another reason for the lack of research agreement. They contend that a possible explanation for lack of agreement among previous researchers may be that the factors that affect the span are level specific. They dealt with only three (size, routineness, and number of different specialties supervised) of the many possible variables but found level specific effects for two of those. Size had little effect at lower levels but a positive effect at middle levels. The number of specialties supervised had a negative effect at middle and lower levels and a positive one at upper levels.

The purpose of this research note is to present the results of exploratory research that (1) attempts to replicate partially the work of Dewar and Simet (1981); (2) suggests an extension of their concepts to other factors that have been hypothesized in the literature as affecting span; and (3) provides a tentative test of the hypothesis that such factors directly affect effectiveness and productivity.

Method

The sample consists of 281 managers from nearly 100 companies at 8 executive development programs at a major university. The companies tended to be concentrated in petrochemical and related industries and utilities. The managers were asked to complete an "organizational characteristics" questionnaire. The questionnaire had been pretested with two earlier groups (36 and 37 managers). As a result of the pretest, some questions were rewritten to improve their clarity. The managers responded either by giving an exact number (if appropriate) or by placing checkmarks along continua (anchored in at least four places).

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[1] The author would like to thank Ricky W. Griffin and two anonymous reviewers for their helpful comments on an earlier draft of this paper.

The questionnaire asked managers to make self-reports for 17 items of information. They were asked for the size of their organization (total number of employees), their level in that organization, and the number in their span. They also were asked to provide a judgment as to their group's productivity and a self-evaluation of their managerial effectiveness. Finally, they were asked to provide information about each of 12 factors that have been identified as being possibly causally connected with the span (Van Fleet & Bedeian, 1977): routinization of tasks, formalization of tasks, number of assistants used, geographic location (dispersion or lack thereof) of subordinates, turnover, stability of operations, need for coordination and/or close supervision, nonsupervisory tasks performed by them, level of technology, training of subordinates, similarity of functions performed by subordinates, and their own self-assessment of their general, overall capabilities as supervisors.

Recognizing the limits of self-report data, especially when dependent and independent variables are obtained from the same subjects, it is believed that this procedure should be capable of detecting any substantial relationships that might exist, although more subtle ones could go undetected. This is because several of the variables are objective (size, level, span, and number of assistants used), and the subjective variables displayed no pattern of high intercorrelations particularly between the self-assessments of group productivity and effectiveness. Another limit to this analysis is that managers in attendance at executive development programs are not likely to be a random sample of managers. With these limitations, the study clearly is exploratory, but it raises interesting issues.

One issue that emerged in the literature is that of the definition of span to be used (Bell & McLaughlin, 1974, 1975; Meissner, 1977; Mintzberg, 1979; Ouchi & Dowling, 1974). To deal with that issue, two questions were asked of the managers: "How many people report directly to you?" and "About how many people do you supervise?" Of the respondents who were asked both questions, 42.5 percent saw them as the same (that is, they gave identical responses to both questions). For those who saw them as two different questions, 96.7 percent responded with larger numbers to the latter question. Discussions with some of the managers who saw the questions as different indicated the perceived difference—"Only half a dozen people report directly to me, but as Plant Manager, I supervise everyone in the plant." In light of these results, then, responses to the former question were taken to approximate more nearly the usual definition of the span of management, and they are used in all of the analyses presented here.

The information about organizational levels obtained from these managers is not identical to that used by Dewar and Simet (1981), but it can be used to assess the effect of levels on the span. The level is termed "first-line" if the manager indicated that his or her level was the lowest in the organization (plus 1 case of next to the lowest in a 14-level organization; $n=31$). The level is termed "executive" if the manager indicated that his or her level was the top level for organizations with up to 8 total levels ($n=4$), the top 2 levels for organizations with 9 to 13 levels ($n = 10$), and the top 3 levels for organizations with 14 or more levels ($n = 5$). Between these two categories, others were divided by equal levels into two groups. One of these is termed "upper managerial" ($n = 53$); the other is termed "lower managerial" ($n = 178$).

Results

Dewar and Simet. The routineness measure used in this analysis ("How routine is the work usually performed by your immediate work unit?") appears similar to that used by Dewar and Simet (1981), and regression analysis seemed to confirm their result in that no significant relations were found at any organizational level. "Similarity of function" used here is roughly a reverse concept to Dewar and Simet's "number of different kinds of specialties reporting." Regression analysis did indicate a positive relation for middle levels, which would be consistent with their findings, but the results were nonsignificant, so no firm conclusions with respect to their findings can be made. Finally, for the size variable, Dewar and Simet used size of the level studied and this analysis used total organization size, so the results would not necessarily be expected to agree. They reported essentially no effect at low and high levels but a positive effect at middle levels; this analysis found no significant effect at any level.

Moderator Variables. Dewar and Simet (1981) essentially argue that the organizational level is a moderator or contingency variable in span analysis. A moderator variable is a variable that identifies a subgroup for which prediction is different than for the total group (Dunnette, 1966). If their results are examined in that more general light, they found that level did not moderate the relation (increase the R^2) between routineness and span but did moderate that between span and size as well as that between span and the number of specialties supervised. Because they did not measure other variables frequently reported as affecting the span, no examination of moderating effects was made for those variables. However, the analysis reported here does have such measures, so that the general proposition that level acts as a moderator can be examined.

Just as organizational level can be conceptualized as a moderator variable in span analysis, so, too, can total organizational size. The findings of Woodward (1965) and Blau and Schoenherr (1971) might suggest just such a conceptualization. To examine these ideas, stepwise regressions were performed with the span as the dependent variable for the total data set and for the set moderated for level alone, size alone, and level and size taken together. Stepwise regression was used as it is a powerful approach for reducing a large number of variables to a smaller and significant set for predicting the dependent variable (Draper & Smith, 1968; Freund & Minton, 1979). If the coefficients of determination (R^2) are larger for the subgroups than for the total, the variable that led to the subgrouping is said to moderate the relationship.

Table 1
Significant Regression Results for All Variables (Dependent Variable: Span Effectiveness or Productivity)[a]

	Size of Organization											
	Small (Less than 500 Employees)			*Medium (500-5000 Employees)*			*Large (5000+ Employees)*			*All Sizes*		
	Dependent Variables			*Dependent Variables*			*Dependent Variables*			*Dependent Variables*		
Level in Organization	*Span*	*Effect*	*Prod*	*Span*	*Effect*	*Prod*	*Span*	*Effect*	*Prod*	*Span*	*Effect*	*Prod*
Executive	Formal .40 (10)	Coord SupCap .58 (10)	Nonsup .45 (10)	(3)	(3)	(3)	(1)	(1)	(1)	Formal .28 (16)	SupCap .30 (15)	Effect .47 (15)
Upper managerial	Locat .20 (17)	Coord Nonsup .47 (17)	Effect .20 (17)	Assts .48 (18)	(18)	Effect .41 (18)	Assts .43 (12)	Assts .35 (12)	Formal Trng Nonsup .79 (12)	Assts .17 (49)	(49)	Effect Formal .42 (49)
Lower managerial	Formal Trnovr .24 (40)	Formal SupCap .19 (37)	Effect Assts Trng .55 (37)	Assts .06 (65)	Nonsup .18 (63)	Effect Tech Trng .38 (62)	(55)	SupCap .44 (53)	Effect Trng .43 (53)	Assts SimFun .05 (162)	SupCap .23 (155)	Effect Nonsup Stable Trng .43 (154)
First-line	(6)	(6)	(6)	(9)	(9)	(9)	Coord .45 (12)	(11)	Effect SimFun .57 (11)	Nonsup .20 (29)	(28)	Effect .14 (28)
All levels	Locat .08 (76)	Formal SupCap Task .20 (73)	Effect Assts Nonsup .51 (73)	Assts .10 (98)	SupCap .14 (96)	Effect Trng .24 (95)	Nonsup .05 (83)	SupCap Trng .15 (79)	Effect Stable Tech Trnovr .46 (79)	Assts SimFun .04 (259)	Formal SupCap Trng .19 (250)	Effect Trng Stable .32 (249)

[a] Only significant variables, the coefficient of determination (R^2), and the sample size (shown in parentheses) are shown. Assts = number of assistants used; Locat = location of subordinates; Coord = need for coordination and/or close supervision; Task = routineness of tasks; Trng = training of subordinates; Tech = level of technology; SimFun = similarity of functions; Nonsup = nonsupervisory activities performed; Formal = formalization of tasks; Trnovr = turnover; Stable = stability of operations; SupCap = superior's capability.

All R^2s are adjusted. R^2 adj. $= 1 - (1 - R^2)[(n-1)/(n-k-1)]$ where n = subjects and k = variables.

All relations: $p \leq .05$.

As indicated by the data for the dependent variable, span, in Table 1, size alone and level alone increase the R^2 values and, therefore, are moderators. Moderating for both together also appears quite useful in most cases. Note, however, that the set of factors that is significantly related to the span generally consists of only one or two variables in each situation, and that those are not the same across levels or size. The number of assistants used is the only factor that is repeatedly significant.

Direct Effects. Van Fleet (1978) hypothesized that variables such as those being discussed here might directly affect managerial effectiveness and/or group productivity rather than the span of management. These same data and procedures were followed using effectiveness and productivity as dependent variables and with the independent variable set expanded to include both the span and effectiveness (for productivity as the dependent variable) and the span and productivity (for effectiveness as the dependent variable). Those results also are shown in Table 1.

There seem to be several interesting points in that analysis. First, the absolute magnitudes of the R^2 terms for effectiveness are greater than those for the span in two-thirds of the situations. In 87.5 percent of the situations, the R^2 values when productivity is the dependent variable are greater than those when span is the dependent variable. Further, in no case did span enter as a significant independent variable for either effectiveness or productivity; in no case did productivity enter as an independent variable for effectiveness; and in all but 2 (of 16) cases effectiveness did enter as an independent variable for productivity.

These results, then, seem to suggest that the factors that usually are conceptualized as influencing the span of management may be more usefully conceptualized as impacting on supervisory effectiveness and/or group productivity. They also seem to suggest that the span itself may not be as important as are these factors. Finally, it is not clear that level or size moderates well for either effectiveness or productivity, although taken together they may do so.

Discussion

Although only exploratory, these results are not entirely surprising. Other empirical efforts seldom have been replicated. There are some exceptions: the need for coordination or closeness of supervision has been repeatedly found *not* to be related to the size of the span (Bell, 1967; Blau, 1968; Udell, 1967); subordinate ability, training, and experience are positively related to the span (Blau, 1968; Udell, 1967); and using assistants or sharing supervision can increase the span (Barkdull, 1963; Filley, 1963; Stieglitz, 1962; Udell, 1967). Even the finding that span appears unrelated to either supervisory effectiveness or group productivity is not without precedent. Ronan and Prien (1973) reported no relation between span and effectiveness; and Dalton, Todor, Spendolini, Fielding, and Porter argued that, at least for some "reasonable" range, "there will be no difference in performance attributable to structure" (1980, p. 61).

This is certainly reasonable. Conscious decisions are made about the number in the span during organization and reorganization certainly, but most decisions that affect the number of subordinates of any particular supervisor occur when people join or are hired, leave or are fired, or the like. The structure tends to evolve under the influence of personnel decisions, budget and contract constraints, and historical trends. In personnel actions the factors that receive attention are not likely to be the ones usually conceived of as affecting the span. It may well be that existing spans in ongoing organizations are more the result of micro- rather than macro-factors, that is, personnel decisions rather than organizational design decisions (Van Fleet & Bedeian, 1978). Perhaps the span of management itself actually is an intervening variable between factors such as those usually described and effectiveness and/or productivity (Van Fleet & Bedeian, 1977). The method suggested by Dewar and Werbel (1979) or path analysis (Pfaffenberger, 1979) could be used to examine that view.

Conclusions

The exploratory research reported here seems to replicate, partially, and to support that of Dewar and Simet (1981), and it may suggest a bit more. First, great care must be taken with regard to operational definitions in doing research on the span of management. Second, few of the factors that many texts present as related to the span appear to be supported by empirical research—in part because the moderating influences of level and size have not been taken into account and in part because the span is only one mechanism for achieving organizational coordination (Van de Ven, Delbecq, & Koenig, 1976). Third, perhaps the concern in such research should be with criteria of effectiveness or productivity rather than the "span," or even "unit size" as suggested by Mintzberg (1979). Span may be important only to the extent that it directly or indirectly affects effectiveness or productivity, and the research presented here suggests that such effects may not exist. Certainly this hypothesis merits more careful research and analysis.

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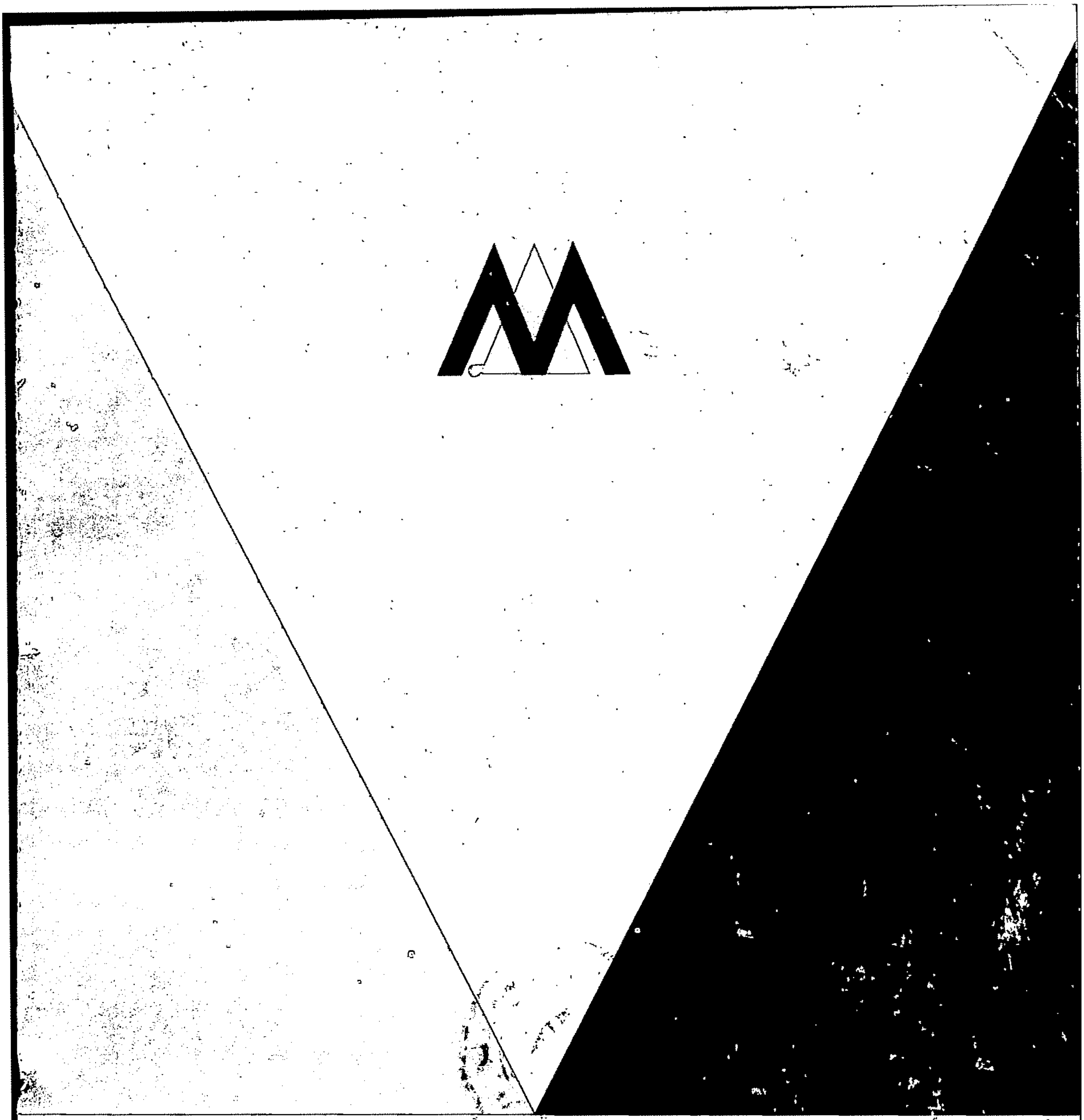

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Editorial Comment

Viewing management research from the Editor's office provides a perspective not available to readers of the *Journal*. First, one reads many more papers; 440 manuscripts were submitted during the 12 months ending July 15, 1983. Obviously, not all of these will be published, and the Editor's office gains a broader perspective on research activity than is available to readers. Second, articles are accepted approximately one year in advance of publication; the Editor's office is aware of research trends prior to readers. My comments relate to observations reflective of these perspectives.

There is a surge in management research in most fields of interest represented by the professional divisions. Manuscripts reflecting all fields are being received. This is encouraging.

Many manuscripts employ concepts, theoretical models, and analytic techniques unknown to management scholars until recent years. Certain of these are quite innovative and appear to offer considerable potential. Others occasionally appear to focus solely upon illustrative demonstration. Illustrative demonstrations of a model or technique have limited value, however. What is more useful is comparative evaluation where the new concept or technique is pitted against more traditional approaches to the same topic of investigation. The novelty value of a new approach is quite limited; what is needed is demonstration of relative advantage of a new approach.

One such new approach is termed "qualitative research." When questioned about the *Journal*'s receptivity to qualitative research, I admit to difficulty in distinguishing between qualitative and nonqualitative research. The *Journal* is committed to focus upon empirical research, but makes no distinction between qualitative and nonqualitative research. To the extent that qualitative refers to elements of judgment in measurement and data collection, it is accepted that judgment enters into every research effort. Mere application of judgment in research is not a criterion for reviewing submissions to the *Journal*.

Review of submissions to the *Journal* does focus upon several key issues. Reviewers are concerned first with whether or not the research question is meaningful, with the potential value of answering the question posed for investigation. Second, reviewers must be concerned that the data and analytic techniques employed to answer the research question are appropriate for each other and the question. Results of the reported research must be judged trustworthy, reliable, and meaningful. Finally, of course, the quality of communication is important; this, however, is more easily corrected than a completed research design.

A statistical summary of the *Journal*'s operations for the year ending July 15, 1983, is presented below:

Total new manuscripts submitted	440
Manuscripts accepted	66
Manuscripts rejected	298
Manuscripts under revision	68
Manuscripts under review	74
Average review time	29 days

Papers already accepted for publication will, when published, demonstrate the recent advances in quality and diversity of management scholarship.

Members of the Review Board are to be congratulated for their many contributions during the year. Ad hoc reviewers (listed on page 566) have been particularly helpful in coping with the increased diversity of topics and methods represented in manuscripts submissions.

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Emotional Exhaustion in a High Stress Organization[1]

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This study develops the concept of emotional exhaustion, an extremely affective and chronic type of work-related strain. Sources of emotional exhaustion were investigated in a police organization that was struggling with major changes. The findings suggest that emotional exhaustion is partially the result of personal characteristics of the employee, interpersonal milieu, and the work itself, but is profoundly affected by departmental context, administrative policy and practices, and the contradictory mandate of police in society.

> The job is stressful, but *nothing* like the stress at 6th Street (Police Station).
> —City street patrol officer commenting on his worklife during interview, September 1981.

During the past decade, quality of work life issues have moved from the periphery to the mainstream of organizational behavior research. Stress has been a key concept guiding numerous inquiries concerned with aspects of employee health and welfare, though, as Schuler (1980) notes, little is currently known about stress in work organizations. This is due partly to the lack of agreement about what constitutes stress and the nonspecific definitions and measures used to research it in organizational settings. Major reviews of the area have detailed the extensive personal, organizational, and societal costs associated with high levels of stress in work organizations and have encouraged further investigations. However, they also have cautioned that until more precise varieties of stress and its consequences (strain) are identified, further research is unlikely to generate integrated and cumulative findings helpful in reducing stress-related problems (Beehr & Newman, 1978; House, 1974; Matteson & Ivancevich, 1979; McGrath, 1976; Schuler, 1980).

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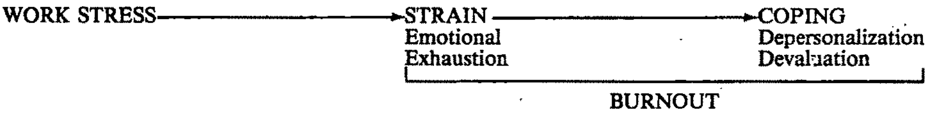
[1] An earlier version of this paper was presented to the Organizational Behavior Division of the Academy of Management in New York City, 1982. The authors are grateful to H. Joseph Reitz, Chester Schriesheim, and Terry Sincich for their thoughtful comments on a previous draft. This research was conducted while the authors were at the University of Florida College of Business in Gainesville, Florida.

Burnout, a term used to describe a particular type of stress reaction or strain, is defined as a syndrome of emotional exhaustion and cynicism towards one's work in response to chronic organizational stressors (Maslach & Jackson, 1981, 1982). The importance of the burnout concept is suggested by its relationships with organizational outcomes, such as absenteeism, turnover, job dissatisfaction, and a decrease in the quality of job performance; with personal outcomes, such as alcohol and drug use, physical and mental disorders, and the disintegration of family and social relationships (Maslach & Jackson, 1981).

Emotional exhaustion, the dimension of burnout investigated here, is one of the more extreme varieties of work-related strain. It manifests in employees as a general loss of feeling and concern, trust, interest, and spirit (Maslach, 1982b). It also involves feelings of fatigue, being used up, irritability, frustration, and wearing out (Maslach & Jackson, 1981). In other words, employees' emotional resources become depleted, and they no longer feel able to give of themselves at a psychological level.

Emotional exhaustion was selected as the sole dependent variable in this study for several reasons. First, there appears to be general consensus in the literature that emotional exhaustion is the central or core dimension of burnout (Maslach, 1982b). Second, emotional exhaustion may be conceptualized as the first stage of burnout and therefore provides a critical point for intervention. It has been proposed that burning out involves a sequential process (Cherniss, 1980a; Maslach, 1982a), and that it consists of three dimensions: emotional exhaustion, depersonalization of clients, and devaluation of one's accomplishments and oneself (Maslach & Jackson, 1981). Merging these two propositions, a model of the burnout process can be specified as shown in Figure 1.

Figure 1
Model of the Burnout Process



A third reason for choosing emotional exhaustion is its chronic and intensely affective nature. Emotional exhaustion has properties similar to ordinary states of fatigue, but is closer to chronic fatigue because of its pervasive and enduring qualities (Griffith, Kerr, Mayo, & Topal, 1950). Research has suggested that fatigue states and accident proneness are related (Collier, 1943) and that chronic fatigue is a concomitant of physical ill-health (Bartely & Chute, 1947). Consequently, emotional exhaustion serves as a unique quality of working life indicator with the potential to estimate the cumulative effects of work stresses. In addition, emotional exhaustion is first and foremost a feeling state. It is a valuable addition to the set of quality working life concepts, particularly to the extent that "feelings are the dominant independent force in our everyday lives" (Douglas, 1977, p. 23). Thus, although emotional exhaustion is related to other strains, such as physical fatigue, tension, anxiety, insomnia, alcohol and drug use, withdrawal from people, and poor relations with spouses and children (Maslach & Jackson, 1981), it is one of the few concepts of strain that captures both the chronic and intensely affective aspects of the work experience.

Fourth, emotional exhaustion is the dimension of burnout that seems most applicable to occupations other than human services. Burnout has been almost exclusively associated with those who deal with clients, such as physicians, nurses, social workers, firemen, and police officers (Perlman & Hartman, 1982). However, because of its similarity to chronic fatigue states, emotional exhaustion (unlike client depersonalization and self-devaluation) appears generalizable to air traffic controllers, miners, steel workers, assemblers, office workers, and others who are exposed to fatiguing work conditions.

It usually is assumed that police work is particularly stressful because of the severe psychological and physiological problems experienced by police employees, such as marital strain, alcohol and drug abuse, heart disease, and suicide. These are not, of course, direct measures of experienced work stress, but instead are presumed consequences of work-related problems. The extent of actual stress experienced in police organizations and the specific sources of stress are currently unknown (Terry, 1981).

In police work, emotional hazards are present in the job itself: constant exposure to society's interpersonal violence; subservience to an ambivalent, watchful public; and extreme psychological separation from the policed. These potential sources of emotional exhaustion carry from the street to the offices where technical, administrative and clerical staffs support the police mandate.

As the beginning quotation suggests, emotional hazards also are present in the existing psychosocial organization of policing. The emotional strain from these may be far more difficult to contain than hazards related to the work itself. For members of organizations operating under extreme community pressures, such as police organizations during street crime epidemics, sources of emotional exhaustion may exist as much in administrative practices and the context of work as in the interpersonal demands and physical hazards resulting from work performance.

The purposes of the present study are: (1) to compare levels of emotional exhaustion among employees and across departments within a police organization; (2) to compare levels of emotional exhaustion of police department employees with those measured in previous research involving other occupations; and (3) to examine conditions producing emotional exhaustion that are rooted in the jobs, social contexts, and administrative practices of a police department.

Predictors of Emotional Exhaustion

In an attempt to isolate and categorize potential sources of emotional exhaustion, the available burnout literature was reviewed. However, an actual theory of burnout, including antecedents and consequences, does not exist. The broader stress literature was then reviewed for a framework that would assist in building a model of the sources of emotional exhaustion.

Four frameworks (Beehr & Newman, 1978; Brief, Schuler, & Van Sell, 1981; Cooper & Marshall, 1976; Schuler, 1980) were identified that reflect the implicit categories of predictors used in emotional exhaustion research. Categories representing environmental/organizational and individual sources are common to the frameworks developed by Beehr and Newman (1978), Cooper and Marshall (1976), and Schuler (1980). The fourth model, developed by Brief et al. (1981), includes categories that best represent predictors prevalent in the emotional exhaustion literature. This model, along with information gathered during interviews with members of the organization studied, guided specification of the predictor set. The independent variables may be categorized as follows: personal characteristics, interpersonal factors, task properties, organizational variables (Brief et al., 1981), and departmental context (used as a control variable).

Personal characteristics, such as sex, marital status, and length of time in a work position, have been found to be related to important organizational outcomes. The evidence indicates that this is the case with emotional exhaustion. In a sample of 1,025 human service workers, Maslach and Jackson (1981) found that females scored significantly higher than males on both frequency and intensity of emotional exhaustion. Maslach and Jackson (1981) also found that marital status was related to emotional exhaustion. Single and divorced individuals had significantly higher frequency and intensity scores than did those who were married.

Both the empirical evidence and theoretical literature support the contention that one is most vulnerable to emotional exhaustion during the first one to two years on the job (Armstrong, 1977; Freudenberger, 1974, 1977; Maslach & Jackson, 1981). This seems to be a time when aspirations to change society diminish and day-to-day demands become reality.

Interpersonal aspects of work, including supportive leader behavior and group cohesiveness, have been postulated to decrease the incidence of emotional exhaustion (Cherniss, 1980a; Freudenberger, 1974, 1977; Maslach, 1976; Mattingly, 1977). Maslach and Pines (1977) discovered that frequent staff meetings in which employees could share experiences and provide support for each other were associated with lower rates of emotional exhaustion. Pines and Kafry also found social support systems to be significantly, inversely correlated with tedium—a concept defined as a "general experience of physical, emotional, and additudinal exhaustion" (1978, p. 499).

The nature of the work is considered to be a very powerful predictor of emotional exhaustion by most researchers in this area (Freudenberger, 1974, 1975, 1977; Maslach, 1976, 1978; Mattingly, 1977). Jobs high in one or more of the core job dimensions identified by Hackman and Oldham (1974, 1975) were theorized to be related to lower emotional exhaustion. Pines and Kafry (1978) found no significant relationship between tedium and task variety, significance, or autonomy. However, feedback from the job itself was negatively related to tedium.

Kafry and Pines (1980) reported a three-sample study in which task variety and autonomy were significantly related to tedium in all but one group. The results for task significance and feedback were mixed. Maslach and Jackson (1981) reported a significant negative correlation between feedback from the job and emotional exhaustion. However, the correlation coefficient between task significance and emotional exhaustion was not significant, and no results for task variety, identity, autonomy, or motivating potential of the job were reported.

In addition to the core task characteristics, Maslach (1976) and Mattingly (1977) discuss the possibility that physical danger associated with the task could increase levels of emotional exhaustion. However, Kafry and Pines (1980) did not find physical danger to be significantly related to tedium in their sample of college students and professionals.

Because administrative practices may be major sources of emotional exhaustion, four organizational variables were studied. Because of the importance of compensation and career advancement issues to employees, perceptions of pay equity and promotion opportunity within the organization were hypothesized to affect emotional exhaustion. Eisenberg (1975) cites inadequate reward systems as a major stressor in policing, and interviews with organizational members indicated that pay equity was an issue of vital concern to many. In a survey conducted by Hurrell (1977), approximately 90 percent of U.S. police officers sampled thought their pay was unfair compared with other occupations. However, Pines and Kafry (1978) report no correlation between pay satisfaction and measures of tedium.

Freudenberger (1977) discussed the relationship between promotional opportunities and emotional exhaustion, stating that both lateral and vertical movement within an organization are critical to prevent or at least minimize emotional exhaustion. Reiser (1974) and Eisenberg (1975) elaborate on the stress in police departments due to the absence of career development opportunities and exacerbated by the competitive nature of police officers.

Structural variables, such as formalization and rule inflexibility, are among the more complex correlates of emotional exhaustion. Maslach (1978) remarked that "while the existence of. . .rules can promote emotional stress for the staff, they can also be used to avoid such stress" (p. 117). Freudenberger (1977) concluded that structure, rituals, and routines are important factors in preventing emotional exhaustion. On the other hand, many authors discuss the presence of rules and/or rule rigidity as major contributors to employee stress (Cooper & Marshall, 1976; Davidson & Veno, 1980; Payne, 1980; Shostak, 1980).

The available research also is conflicting. Armstrong (1977) and Cherniss (1980b) found that structural variables such as highly formalized rule observation, job codification, and highly centralized decision making were positively related to emotional exhaustion. However, Maslach and Pines (1977) and Pines and Maslach (1980) found that nonstructured day care programs were correlated with greater emotional exhaustion. Thus, the effects of organizational structure on emotional exhaustion appear to be significant, but highly intricate.

The last category of variables in the predictor set can best be described as contextual. Parasuraman and Alutto define context as "an individual's location in organizational space" (1981, p. 52). In this study, context refers to the specific bureau or department to which the individual is assigned. Context is used as an independent variable for several reasons. First, interview data indicated that there were major differences among bureaus. Second, context is a variable that can be measured objectively. Third, context too often has been a neglected area in field studies, despite a growing awareness of how important it is in shaping attitudes and behavior of individuals (Rousseau, 1978). Fourth, there is empirical evidence suggesting that departmental membership is a critical factor in understanding the source and intensity of stressors in the work place (Parasuraman & Alutto, 1981).

Much of what has been written on emotional exhaustion is based on clinical observation and/or speculation rather than on empirical evidence. With the exception of Maslach and her associates, very few attempts have been made systematically to explore and describe the sources or outcomes of emotional exhaustion. This study isolates some of the factors that contribute to states of emotional exhaustion in high stress organizations.

Method

Sample and Procedure

The study is based on data obtained from a sample of officers and support personnel employed by a police department in a southern town of about 100,000 residents. The community is heavily influenced by a large university, faced with the fourth highest crime rate per capita in the nation, and populated by residents seeking to affect police policies. The police organization is the site of long-standing racial tensions within the ranks, is managed by a recently appointed black police chief, and may be characterized as an institution struggling with major changes.

Approximately five weeks prior to collection of questionnaire data, intensive interviews were conducted with a cross-section of the organization's members. This was supplemented by accompanying officers on patrol during each of the three shifts in a variety of the city's zones. Following this, a questionnaire was designed and administered to 96 percent of the organization's employees (208 out of 217) during normal working hours. Completion time was approximately 45 minutes, and respondents were assured of anonymity. Deleted from the analysis were 39 employees, leaving 169 in the study. Of the 39 deleted, 16 were managers (who were not subjected to the same type of stressors as patrol officers and investigators), 3 were from a bureau (internal inspections) too small to describe and analyze as the other bureaus were, 18 were in special positions (clerical, technical, administrative, etc.) without bureau assignments, and 2 missed items when filling in the questionnaire. The final sample, then, included 87 street patrol officers (patrol bureau), 34 investigators (investigations bureau), and 48 clerical and other support personnel (services bureau). Approximately 44 percent of the sample worked day shift; 24 percent worked evening shift; 20 percent worked night shift; and 12 percent worked flexible hours.

Of the respondents, 69.6 percent were male; 44.4 percent were between 20 and 30 years old; 43.3 percent were between 31 and 40 years old; 10 percent were between 41 and 50 years old; and 2.3 percent were over 50 years of age. Of the sample, 28.7 percent held a high school diploma; 46.2 percent had some college education but no degree; 18.1 percent had a college degree; and 6.4 percent had some graduate education. Of the respondents, 18.1 percent were single; 65.5 percent were married; 16.4 percent were divorced, separated, or widowed. Further, 21.1 percent of the sample had been with the organization 2 years or less; 52.6 percent between 2 and 10 years; and 26.3 percent had more than 10 years tenure.

Measures

Dependent Variables. Frequency and intensity of emotional exhaustion were measured using the emotional exhaustion subscale of the Maslach Burnout Inventory (Maslach & Jackson, 1981). This scale has been used in a variety of public service organizations, and its psychometric properties are documented by Maslach and Jackson (1981). Two aspects of emotional exhaustion—frequency and intensity—were utilized as dependent variables to delineate further and to refine this concept of strain as it relates to work life. Frequency indicates how often one experiences the emotion, such as "a few times a year" or "every day." Intensity refers to how strongly the feeling is experienced (e.g., "barely noticeable" or "very strongly").

Suchman (1950), who initiated the early research in measurement of attitude intensity, found intensity of feeling to be empirically independent of other feeling states. Maslach and Jackson (1981) found that intensity of emotional exhaustion correlated moderately with frequency across items ($r = .35$ to .73, with a mean of .56). In this sample, intensity also was moderately correlated with frequency across items ($r = .24$ to .77, with a mean of .42). Other recent research (Gann, 1979; Jackson & Maslach, 1982) has suggested that frequency and intensity sometimes produce different relationships with situational and personality variables. Participants also have indicated a preference for the two-dimensional format because it allows them to give a more precise response (Maslach & Jackson, 1981). In this sample, the reliability coefficients of .90 (frequency) and .87 (intensity) were comparable to previous internal consistency estimates calculated using Cronbach's coefficient alpha.

Independent Variables. The predictor set included five categories of variables that were derived from previous theory and research: personal, interpersonal, task, organizational, and contextual. Each of the personal variables—length of time in the position, marital status, and sex—was measured categorically in a section of the questionnaire on background information.

The interpersonal category included one measure of formal leadership and one of work group cohesion. Supportive leader behavior was measured using a 6-item scale developed and validated by Schriesheim (1978). The alpha coefficient for this sample was .86. Group cohesiveness was measured using Stogdill's (1965) 5-item scale. The reliability coefficient was .91.

Task motivating potential was measured with Hackman and Oldham's (1974, 1975) Job Diagnostic Survey (JDS). From this instrument, 15 items were used to calculate a motivating potential score for each respondent. The five core job dimensions were combined into a single index because previous research has questioned the dimensionality of the JDS (Aldag, Barr, & Brief, 1981; Roberts & Glick, 1981) and because a factor analysis of these data yielded a factor structure inconsistent with Hackman and Oldham's model. The coefficient alpha of the measure was .80. Physical danger was measured by three items written for this study. A sample item is: "I am directly exposed to physical harm in carrying out my job." The reliability coefficient for these items was .95.

Pay equity was measured using the 5-item subscale from the original Minnesota Satisfaction Questionnaire (Weiss, Dawis, England, & Lofquist, 1967). The internal reliability for this sample was .85. Promotion opportunity was measured by three items developed for this study. A representative item is: "There are many dead-end jobs in this organization." The scale's alpha coefficient was .66.

Formalization was measured using four items adapted from Hage and Aiken (1969). The scale's reliability coefficient was .75. Rule inflexibility was measured with a 3-item scale from Kerr and Jermier's (1978) substitutes for leadership scale. The alpha coefficient was .67.

Both formalization and rule inflexibility were measured at the individual level to attempt to capture the shades of meaning in rule emphasis within bureaus and across positions. Because the focus was the meaning of rules—specifically, how they may be used as resources and how they relate to strain—individual perceptions of the presence of rules and degree of rule following were measured. The analysis was performed at the individual level (consistent with measurement), avoiding the problems of aggregating individual responses to create organizational or departmental scores.

Context was measured categorically by asking respondents to indicate the bureau to which they were assigned—patrol, investigations, or services. The patrol bureau is composed of sworn police officers and sergeants whose primary responsibility is patrolling the city and responding to calls for assistance from the citizenry. The investigations bureau is composed of detectives and a narcotics/organized crime division. The detective division handles all follow-up on crimes that are committed, and the narcotics division is an autonomous unit that works closely with the sheriff's department on illegal drug trafficking. The service bureau is composed mainly of support personnel, such as secretaries, records technicians, and other civilian employees.

Following Rousseau (1978) and Parasuraman and Alutto (1981), departmental assignment was specified to identify aspects of the context in which individual responses occur. Although the unit of analysis is the individual, according to Roberts, Hulin, and Rousseau (1978) it is defensible to attempt to understand individual responses by using group or organization level variables. The potential problem with this approach is that aggregate level scores assigned to individuals can mask heterogeneity. This problem was avoided. A global, categorical operationalization of departmental context was used (Roberts et al., 1978) instead of aggregating individual responses to create a departmental "score" on a variable. Also, following Kerlinger and Pedhazur (1973), Cohen and Cohen (1975), Lewis-Beck (1980), and others, context was contrast-coded using dummy variables. Because context is treated categorically and not ordinally, and comparisons are made across bureaus (not within), homogeneity with respect to any single variable is not an issue. Global data are not divisible across individuals, and categorical data may be objectively assigned to individuals without displacement of scope, assuming the analysis is conducted at the individual level with the goal of comparing across categories.

Analyses

Regression analyses were performed to determine the significant sources of emotional exhaustion for this sample. Using a hierarchical program, frequency and intensity of emotional exhaustion were regressed on the predictor set. Context (specified using dummy variables) was forced in first; all other variables entered freely according to significance level.

Moderated regression analyses then were performed to determine which predictors, in interaction with departmental context variables, added significantly to the model's main effects. Because of sample size limitations, only two interaction terms were added to the main effects and tested for significance at a time. For example, interaction terms consisting of departmental context and years in the position were specified, added to the main effects, and tested for significance. Those interaction terms then were replaced by interaction terms consisting of departmental context and sex, and the entire model was estimated again. The procedure was repeated until each predictor was used in this manner.

Results

Means, standard deviations, and reliability coefficients are presented in Table 1. All the scales exhibit acceptable internal consistency estimates.

Table 1
Means, Standard Deviations, and Reliabilities[a]
($N = 169$)

Variables	*Number of Items*	*Mean*	*Standard Deviation*	*α*
1. Years in position	1	4.5	2.0	—
2. Sex	1	1.3	.5	—
3. Marital status	1	1.3	.5	—
4. Supportive leader behavior	6	21.8	4.8	.86
5. Work group cohesiveness	5	17.9	4.3	.91
6. Task motivating potential	15	113.4	54.0	.80
7. Physical danger	3	9.3	3.9	.95
8. Pay equity	5	12.7	4.3	.85
9. Promotion opportunity	3	7.4	3.8	.66
10. Formalization	4	14.7	3.3	.75
11. Rule inflexibility	3	9.8	2.4	.67
12. Emotional exhaustion:				
Frequency	9	18.4	12.1	.90
Intensity	9	26.5	13.9	.87

[a] Reliabilities calculated using Cronbach's alpha formula.

The average levels of emotional exhaustion in the total sample (frequency = 18.4; intensity = 26.5) were significantly lower ($p < .01$) than were those found by Maslach and Jackson (1981) in their study of a diverse sample of human service employees. Within the organization, significantly higher levels of emotional exhaustion ($p < .05$) were reported by members of the patrol (19.7) and service (19.1) bureaus than by members of the investigations (14.8) bureau, but only on the frequency measure. Intensity of experienced emotional exhaustion was not significantly different across departments.

Correlations among the measures are shown in Table 2. Although about one-third of the correlation coefficients among the predictor set are significant, none is large enough to cause concern about excessive bivariate multicollinearity (Cohen & Cohen, 1975), and only 5 of 78 coefficients are greater than .4.

As shown in Table 3, departmental context is not directly related to emotional exhaustion when other predictors are considered. Several significant bivariate correlations became insignificant when their independent effects were estimated. Frequency of exhaustion was significantly related to: sex of the respondent (females report higher levels than males; $F = 5.30$, $p < .05$); motivating potential of the task (inversely; $F = 3.89$, $p < .05$); promotion opportunity (inversely; $F = 16.34$, $p < .01$); and rule inflexibility (positively; $F = 7.40$, $p < .01$). Formalization, pay equity, physical danger, work group cohesiveness, supportive leader behavior, marital status, and years in the position did not exert significant independent effects on frequency of exhaustion. The most powerful predictor was promotion opportunity, which accounted for approximately 17 percent of the variance in frequency of exhaustion when considered in additive combination with departmental context. Promotion opportunity was the only significant predictor of

Table 2
Intercorrelations[a]
($N=169$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Context (D1)[b]	(–)														
2. Context (D2)[c]	–.51	(–)													
3. Years in position	.22	.01	(–)												
4. Sex	–.12	–.38	–.23	(–)											
5. Marital status	–.17	.03	–.32	.27	(–)										
6. Supportive leader behavior	.11	–.07	–.08	.06	–.01	(–)									
7. Work group cohesiveness	.22	.09	–.05	–.16	–.09	.42	(–)								
8. Task motivating potential	.26	–.07	.06	–.07	–.08	.43	.33	(–)							
9. Physical danger	–.07	.57	.01	–.50	–.08	.02	.20	.15	(–)						
10. Pay equity	.00	–.24	–.13	.29	.12	.16	.06	.14	–.40	(–)					
11. Promotion opportunity	.04	.02	–.13	–.06	.08	.21	.14	.27	.07	.33	(–)				
12. Formalization	.00	.36	.07	–.15	–.04	.08	.15	.20	.22	–.01	.15	(–)			
13. Rule inflexibility	.16	.00	.11	–.13	–.09	.32	.26	.26	.14	.04	.23	.27	(–)		
14. Emotional exhaustion:															
Frequency	–.16	.10	.13	.08	–.05	–.24	–.18	–.29	.06	–.22	–.39	–.06	.02	(–)	
Intensity	–.09	.04	.19	.00	–.10	–.16	–.20	–.21	.03	–.22	–.36	–.10	–.01	.80	(–)

[a] $r_{xy} > .16$, $p < .05$; $r_{xy} > .21$, $p < .01$.

[b] D1 = contrast between investigations bureau and service bureau.

[c] D2 = contrast between patrol bureau and service bureau.

Table 3
Frequency and Intensity of Emotional Exhaustion Regressed on Independent Variables
($N = 169$)

Predictor	Frequency of Exhaustion		Intensity of Exhaustion	
	Beta Weight	F Ratio	Beta Weight	F Ratio
1. Context (D1)[a]	−.08	.61	−.07	.55
2. Context (D2)[b]	.06	.28	.01	.00
3. Years in position	.11	2.16	.15	3.41
4. Sex	.20*	5.30	.06	.45
5. Marital status	−.04	.29	−.06	.55
6. Supportive leader behavior	−.13	2.62	−.02	.04
7. Work group cohesiveness	−.06	.46	−.13	2.33
8. Task motivating potential	−.16*	3.89	−.09	1.21
9. Physical danger	.14	1.95	.08	.63
10. Pay equity	−.04	.25	−.06	.51
11. Promotion opportunity	−.31**	16.34	−.29**	12.79
12. Formalization	−.05	.34	−.08	.86
13. Rule inflexibility	.21**	7.40	.13	2.60
	$R^2 = .29$**		$R^2 = .22$**	

[a] D1 = contrast between investigations bureau and service bureau.
[b] D2 = contrast between patrol bureau and service bureau.
*$p < .05$
**$p < .01$

intensity of exhaustion ($F = 12.79$, $p < .01$), accounting for nearly 14 percent of the criterion variance when considered in additive combination with departmental context.

As shown in Table 4, 5 of the 11 predictors were significantly related to the criterion when considered interactively with departmental context: sex, group cohesiveness, physical danger, pay equity, and rule inflexibility. This indicates that these variables have a context-specific effect on emotional exhaustion (in addition to a general effect across departments in the case of sex and rule inflexibility). Generally, significant interaction terms indicate that the slope of the line estimating the relationship between predictor and criterion differs, depending on the context.

The difference in emotional exhaustion between males and females is smaller in the service bureau than in the investigations bureau ($F = 4.47$ for frequency, $F = 4.23$ for intensity; $p < .05$). That is, mens' and womens' reported levels of emotional exhaustion were more similar if working in services than if working in investigations. The insignificant betas for the D2 × sex interaction indicate that the differences in emotional exhaustion between men and women were similar in the patrol and service bureaus.

Group cohesiveness related to intensity of exhaustion differently in the investigations bureau than it did in services. Higher group cohesiveness inversely affected intensity of exhaustion significantly more for members of the investigations bureau than it did for service bureau employees ($F = 4.41$, $p < .05$). The effects of group cohesiveness on intensity of exhaustion were not significantly different between patrol and service bureaus.

Table 4
Frequency and Intensity of Emotional Exhaustion: Moderated Regression Results
($N = 169$)

Predictor	*Frequency of Exhaustion*		*Intensity of Exhaustion*	
	Beta Weight	*F Ratio*	*Beta Weight*	*F Ratio*
1. D1[a] × years in position	−.25	.94	−.22	.69
D2[b] × years in position	−.12	.29	−.09	.15
R^2	.29		.22	
2. D1 × sex	−.52*	4.47	−.53*	4.23
D2 × sex	−.02	.00	.08	.09
R^2	.31		.25	
3. D1 × marital status	−.22	.84	−.07	.09
D2 × marital status	.11	.20	.30	1.23
R^2	.29		.23	
4. D1 × supportive leader behavior	.09	.06	−.28	.49
D2 × supportive leader behavior	.02	.00	−.14	.13
R^2	.29		.22	
5. D1 × work group cohesiveness	−.38	.62	−1.04*	4.41
D2 × work group cohesiveness	−.46	1.38	−.63	2.43
R^2	.29		.24	
6. D1 × task motivating potential	.21	.88	−.13	.32
D2 × task motivating potential	−.16	.64	−.24	1.38
R^2	.30		.23	
7. D1 × physical danger	.60*	6.28	.81**	10.93
D2 × physical danger	.41	1.74	.61	3.65
R^2	.32		.27	
8. D1 × pay equity	−.27	1.16	−.16	.35
D2 × pay equity	−.52*	4.48	−.44	2.98
R^2	.31		.23	
9. D1 × promotion opportunity	.02	.02	.11	.28
D2 × promotion opportunity	−.20	1.15	−.07	.14
R^2	.29		.22	
10. D1 × formalization	−.11	.06	−.68	2.21
D2 × formalization	.10	.04	−.22	.17
R^2	.29		.23	
11. D1 × rule inflexibility	.81*	3.96	.67	2.44
D2 × rule inflexibility	.77*	4.81	.82*	4.95
R^2	.31		.25	

[a] D1 = contrast between investigations bureau and service bureau.
[b] D2 = contrast between patrol bureau and service bureau.
*$p < .05$
**$p < .01$

The effects of physical danger on the criteria also varied by department. For investigators, as danger level increased, so did the rates of change in exhaustion compared with service employees, especially in intensity of exhaustion ($F = 6.28$ for frequency, $p < .05$; $F = 10.93$ for intensity, $p < .01$). That is, there are significant differences in reactions to danger when comparing investigations and services: investigators experienced significantly higher emotional exhaustion as danger increased than did service employees.

The relationship between pay equity and frequency of exhaustion was different for patrol officers than for service employees. Patrol officers experienced significantly greater frequency of exhaustion in reaction to pay inequities than did service employees ($F = 4.48$, $p < .05$).

Finally, reactions to inflexible rules differed by department. Significantly greater frequency and intensity of exhaustion were experienced by patrol officers when faced with highly inflexible rules than by service employees faced with highly inflexible rules ($F=4.81$ for frequency, $F=4.95$ for intensity; $p<.05$). Significantly greater frequency of exhaustion was experienced by investigators when faced with highly inflexible rules than by service employees faced with highly inflexible rules ($F=3.96$; $p<.05$). In other words, inflexible rules produce more strain in patrol and investigative employees than in service employees.

Discussion

This study evaluated the effects of five categories of variables on emotional exhaustion in a police organization. The results show that three of the four organizational variables were significant predictors of emotional exhaustion. In addition, at least one variable from each category significantly predicted frequency and/or intensity of emotional exhaustion—either by a main effect or by an interaction with departmental context.

Although lower levels of emotional exhaustion were found here than those reported by Maslach and Jackson (1981), the levels in this sample may be high enough to cause concern. Emotional exhaustion refers to an extreme feeling state, and even small amounts of this type of strain, experienced a few times per month, may warrant attention.

One possible explanation for the higher scores in Maslach and Jackson's (1981) study is that 54 percent of their sample were female, compared to 30 percent of this sample. If females actually experience higher emotional exhaustion than do males (Maslach & Jackson, 1981), this could account for the difference found in the two samples. An additional explanation for the discrepancy involves the occupational composition of the samples. Maslach and Jackson's (1981) sample was a diverse human service group, whereas this sample was composed primarily of sworn police officers. It is plausible that this group has learned to cope with work-related stress as some other occupations do—by refusing to acknowledge its existence (Haas, 1977).

In comparing departments within the organization, lower levels of emotional exhaustion were found in the investigations bureau than in either the patrol or service bureaus. This conceivably could be explained by the higher status of detectives and narcotics agents, as well as the relatively enriched nature of their work.

Frequency of exhaustion was predicted by only one of the personal variables—sex of the respondent. This agrees with Maslach and Jackson's (1981) finding that females score higher on frequency of emotional exhaustion than do males. Unlike their results, though, there were no differences in this sample between males and females in intensity of exhaustion.

Higher levels of emotional exhaustion experienced by women may result from differences in reaction patterns of males and females to the same stressors, or from differences in actual stressors encountered in the workplace. Perhaps women entering male-dominated occupations are less successful in overcoming traditional sex-role socialization than is often suggested (Terborg, 1977), and they experience more emotional exhaustion as a result. However, it is more likely that women in nontraditional careers experience occupational stressors that males in similar positions do not, such as discrimination, lack of colleague support, and role conflicts (Kanter, 1977).

In contrast to the pattern observed in the total sample—females reported higher levels of emotional exhaustion than males—females employed in the investigations bureau experienced lower levels of emotional exhaustion than did male investigators. This could be due to the very few number of women who enter the ranks of the investigations bureau (six in this sample). Consequently, those who become investigators may have already overcome many of the stress-related problems encountered by females in nontraditional careers.

One interpersonal variable, work group cohesiveness, interacting with context was significantly correlated with intensity of emotional exhaustion for members of the investigations bureau compared with services. This effect may be due to the extraordinary need for closely-knit relationships in the narcotics/organized crime division of investigations. Through preliminary interviews, it became apparent that this unit required stronger collegial bonds to protect its members (both on the job and off) than did any other group in the organization. It stands to reason, then, that this comradery would diffuse some of the intensity of emotional exhaustion resulting from the unusual job demands characterizing narcotics investigation. This supports both the theoretical (Freudenberger, 1974, 1977; Maslach, 1976; Mattingly, 1977) and empirical (Maslach & Pines, 1977; Pines & Kafry, 1978) literature regarding the importance of colleague support in reducing emotional exhaustion.

Both task variables, motivating potential of the task and physical danger, significantly affected emotional exhaustion. Motivating potential of the task (MPS) was negatively related to frequency of exhaustion. This supports and extends the findings that certain job characteristics are associated with lower exhaustion (Kafry & Pines, 1980; Maslach & Jackson, 1981; Pines & Kafry, 1978). It suggests that several properties of enriched tasks are important in preventing or decreasing job strain.

Physical danger also affected emotional exhaustion, but only as it interacted with departmental context. Members of the investigations bureau experienced greater frequency and intensity of emotional exhaustion than did service employees when danger increased. In the only study related to this point, Kafry and Pines (1980) found physical danger and tedium unrelated in samples of college students and professionals. They speculated that this was because their respondents experienced low levels of physical danger, unlike police officers and fire fighters. However, it appears from the present results that severe physical danger does not necessarily produce high emotional exhaustion. Patrol officers reported higher levels of physical danger than did investigators, but they did not experience higher emotional exhaustion as a direct result. This possibly is due to their acceptance of the risk involved in patrol work. Investigators move from patrol in part to avoid risk; when they do encounter dangerous episodes, their reactions are more severe than are patrol officers' reactions. Kafry and Pines' (1980) assertion that the effects of physical danger on stress vary by occupation may be accurate mostly because tolerance for physical danger is conditioned by departmental context and occupational expectations.

Perceptions of pay equity were related to exhaustion more significantly in the patrol bureau than in services. A possible explanation for this finding is that patrol officers in the organization view pay inequities to be mostly present in their bureau (Eisenberg, 1975). Compounding the problem is that members of the investigations bureau receive special monetary compensation for their assignments. Members of the service bureau do not receive extra compensation, but this is little consolation to patrol officers, given the perceived differences in the nature of the work. Patrol officers view their tasks as complex, significant, and extremely difficult and expect pay to reflect these task properties. This finding contrasts with Pines and Kafry's (1978) results derived from a sample of social service workers for whom pay satisfaction was unrelated to tedium.

Promotion opportunity was the most powerful predictor of both frequency and intensity of emotional exhaustion. This finding not only supports the literature hypothesizing that career development programs reduce occupational stress (Eisenberg, 1975; Freudenberger, 1977; Reiser, 1974), but it also verifies the present authors' findings from interviews that lack of promotion and transfer opportunities constitute one of the most serious problems faced by the organization. As organizations such as this one seek to recruit more and more college graduates with high achievement expectations, increased amounts of emotional exhaustion can be expected unless viable career tracks are established. This finding also highlights the tension produced when minorities and women were promoted for the first time in the organization's history. In smaller organizations there are objectively fewer promotion opportunities. When a decision is made to promote, consistent with affirmative action guidelines, the action has symbolic as well as practical significance.

One of the organizational variables, rule inflexibility, affected emotional exhaustion both directly and interactively with departmental context. Although the presence of rules (formalization) had no significant effect on exhaustion, inflexible rules positively correlated with the frequency of emotional exhaustion. This finding may be helpful in interpreting some of the confusing results found by Armstrong (1977), Maslach and Pines (1977), and Pines and Maslach (1980). It appears that the mere presence of rules may be viewed by employees as protective—especially if they have some discretion in how and when they are applied (Jermier, 1982). However, if the rules are rigidly enforced, increased emotional exhaustion may result.

The interaction of departmental context and rule inflexibility becomes clear when interview data are considered. Although unbending rules are a source of strain across bureaus, they are more problematical for some groups than others. Inflexible rules were associated more with emotional exhaustion for both patrol (frequency and intensity) and investigations (frequency) than for services. This probably is because patrol and investigations have long felt justified in bending the rules because of their status in the organization and the importance of their role to society. In contrast, service bureau employees, considered auxiliary personnel by other bureaus, are expected to abide by the rules and overlook infractions by patrol officers and investigators. Consequently, service employees view not only the presence of rules but also the enforcement of those rules as protective and strain-reducing.

The discovery of several departmental context effects in this study adds to the growing body of research on this topic (Ford, 1981; Jermier & Berkes, 1979; Parasuraman & Alutto, 1981; Rousseau, 1978). It also underscores Parasuraman and Alutto's observation that "failure to consider and control for intergroup differences...could be a potentially confounding factor in [discovering] relationships between stressors and other variables" (1981, p. 65). Although no direct, independent effects on emotional exhaustion were attributable to departmental context, it is clear that detailed knowledge about departments is necessary to understand fully the differing effects of rule inflexibility, pay inequities, physical danger, group cohesiveness, and employee sex on levels of emotional exhaustion in this sample.

It appears from these findings that frequency and intensity of emotional exhaustion do not warrant separate analyses in future research. The scales were strongly correlated, and analysis of intensity contributed little to understanding the sources of emotional exhaustion. In addition, a principal components factor analysis of the two scales, obliquely rotated to simple structure, produced a unidimensional solution. Thus, although both subscales and other types of measurement are necessary to capture completely the concept of emotional exhaustion, it appears adequately represented with the frequency format.

In conclusion, it appears that there is considerable support for the initial quotation stating that all of the stress in policing is not created by the work itself; some is the result of internal organizational processes. The practical importance of this discovery is that very little can be done to reduce the hours of monotony coupled with periods of frantic activity experienced by members of modern police organizations. Similarly, little can be done to buffer members of police departments from their ambivalent, demanding publics. Nor can much be done to counteract the stresses inherent in their ambiguous mandate as a coercive instrument of state power and as an organization delivering invaluable human services. As long as one of the basic roles of police in society remains that of enforcing and stabilizing social and economic inequalities that they did not create and rarely benefit from, police work will remain rife with conflict, contradiction, tension, and strain ("The Iron Fist," 1977). However, it is possible to change administrative practices in ways that can significantly reduce stress produced within the organization. Attempts to improve the quality of working life by changing administrative practices should become easier as specific types of strain, such as emotional exhaustion, become better understood.

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Job Satisfaction and the Good Soldier: The Relationship Between Affect and Employee "Citizenship"[1]

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A measure of a wide array of employee activities on the job was completed by employees' supervisors at two points in time; employees reported their own job satisfaction via the Job Descriptive Index. Implications of relationships much higher than typically found in the job satisfaction-performance literature are discussed.

Apparently the dust has settled over what once was a controversial issue: the satisfaction-performance linkage. Organizational psychologists (Lawler & Porter, 1967) generally endorse the view that any covariance between job satisfaction and job performance emerges only when satisfaction results from performance-contingent rewards. Any notion that satisfaction "causes" performance is regarded as naive folk wisdom, not supportable by the empirical record.

Organ (1977) has cautioned that such a position might prematurely reject something of value in lay psychology that endorsed the satisfaction-causes-performance proposition. He suggested that a clue to the possible reconcilability between the phenomenology of countless practitioners and the noncorroborating empirical record might lie in the meaning of "performance." Defined narrowly as quantity of output or quality of craftsmanship—as perhaps operationalized in most of the formal research addressed to this issue—performance does not consistently or appreciably follow from satisfaction in a direct functional relationship. But there are other conceptions of performance that often may be more salient to the practitioner.

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[1] An earlier version of this paper was presented at the 42nd National Academy of Management meetings, New York, 1982.

Katz and Kahn (1966) have noted the many occasions in which organizational functioning depends on supra-role behavior—behavior that cannot be prescribed or required in advance for a given job. These behaviors include any of those gestures (often taken for granted) that lubricate the social machinery of the organization but that do not directly inhere in the usual notion of task performance. Examples that come to mind include: helping co-workers with a job related problem; accepting orders without a fuss; tolerating temporary impositions without complaint; helping to keep the work area clean and uncluttered; making timely and constructive statements about the work unit or its head to outsiders; promoting a work climate that is tolerable and minimizes the distractions created by interpersonal conflict; and protecting and conserving organizational resources. For lack of a better term, the present authors shall refer to these acts as "citizenship" behaviors.

Supervisors presumably value such behaviors, in part because they make their own jobs easier and free their own time and energy for more substantive tasks. One suspects that they value it all the more because they cannot "require" such supra-role, citizenship behaviors, except perhaps to some minimally acceptable or enforceable standards.

There are two distinct conceptual bases for thinking that such behavior would be influenced by job satisfaction (or, at least, the affective state underlying job attitudes). First of all, social exchange theory (Adams, 1965; Blau, 1964) predicts that, given certain conditions, people seek to reciprocate those who benefit them. To the extent that a person's satisfaction results from the efforts of organizational officials and such efforts are interpreted as volitional and nonmanipulative in intent, the person will seek to reciprocate those efforts. The person may not have the ability or opportunity to reciprocate with greater work output or creative solutions to work problems. Citizenship behaviors of the sort described above are more likely to be under the person's control and thus more likely to be a salient mode of reciprocation.

A second basis for predicting this relationship derives from a series of social psychological experiments (Rosenhan, Underwood, & Moore, 1974) which strongly support the contention that prosocial gestures are most likely to occur when a person experiences a generalized mood state characterized by positive affect (Clark & Isen, 1982). To the extent that job satisfaction, as conventionally measured, reflects this positive affective state, it is likely that more satisfied persons display more of the prosocial, citizenship behaviors. As Rosenhan et al. (1974) phrased it, positive affect tends to decrease the psychological distance between self and others, and positive affect tends to generalize from whatever caused it to other stimuli (notably persons) in the temporal and social context.

In sum, it is predicted that there is a causal connection between prior overall satisfaction and subsequent display of a host of citizenship behaviors (as specified below). Moreover, a strong connection for satisfaction with supervision in particular is predicted. The rationale for this prediction is that the immediate supervisor represents the most direct source of variance in events that arouse a felt need to reciprocate or that influence positive affect. Also, citizenship behaviors, it is suspected, are more often seen as "for" (i.e., benefiting) the supervisor than for any other single person representing the organization.

Method

Subjects and Procedure

Data were obtained at two separate times from a sample of employees in a major midwestern state university. A wide variety of jobs in nonacademic, administrative departments were surveyed, including data programmers, loan collectors, student counselors, fund-raisers, accountants, and other professional, supervisory, and technical (nonclerical) positions.

The initial data collection was performed via questionnaire administration at the host departments. One of the researchers met with all members of each department (groups ranged in size from 6 to 16) who completed the measures of job satisfaction. Concurrently, departmental superiors who had frequent contact with the subjects were completing a scale, rating each subject's recent behavior at work. Subjects were not aware that they were being evaluated; they also were assured of the anonymity of their responses. Questionnaires were identified with a code number known only to the researcher and the subject. The second administration employed the same procedure and took place from five to seven weeks after the first collection.

Complete data (including subjects' and supervisors' ratings) were collected for 82 employees at time 1. For various reasons, several individuals were unavailable at time 2. Data were collected at both times for a total sample of 77, which included subjects and their superiors. Of the sample, 29 (38 percent) were female and 48 (62 percent) were male. Their average departmental tenure was 6.8 years.

Measures

Citizenship behavior was measured via the responses of each subject's immediate superior on 30 7-point items. The items tapped a variety of behaviors such as compliance, altruism, dependability, housecleaning, complaints, waste, cooperation, criticism of and arguing with others, and punctuality.

A preliminary meeting with a small group of managers provided information about any ambiguities or irrelevancies on the original items. Internal reliability coefficients for the final scale were $\alpha = .92$ at time 1 and $\alpha = .94$ at time 2, and the test-retest reliability was .80. Although individual items on the scale appear to be behaviorally distinct, the psychometric properties of the scale indicate that it provided a composite criterion that is indicative of an employee's overall evaluation by the supervisor in terms of behavioral effectiveness.

Job satisfaction was measured with the Job Descriptive Index (JDI) developed by Smith, Kendall, and Hulin (1969). The JDI contains five scales pertaining to employees' satisfaction with work, pay, promotions, co-workers, and supervision. The instrument consists of 72 items—18 in each of the work, supervision, and co-workers subscales, and 9 in the pay and promotions subscales. All of the scales are reported to have corrected split-half internal consistency coefficients exceeding .80, and test-retest reliabilities averaging .57 (Schneider & Dachler, 1978).

Data Analysis

Subsequent to descriptive and correlational statistical analyses, the issue of causal priorities was tested via cross-lagged regression analysis (Rogosa, 1980). Basic contextual information is afforded by six correlations between the two variables x and y—static correlations from time 1 and time 2 ($r_{x_1y_1}$ and $r_{x_2y_2}$), two autocorrelations ($r_{x_1x_2}$ and $r_{y_1y_2}$) that indicate the test-retest reliabilities or stabilities of the two variables, and two cross-lagged correlations ($r_{x_1y_2}$ and $r_{y_1x_2}$) between the time 1 value of one variable and the subsequent time 2 value of the other variable.

Causal analysis and tests of spuriousness typically are conducted by statistical corrections and comparisons for the magnitudes of the cross-lagged correlations (Kenny, 1975). However, recent criticism of cross-lagged correlation (Rogosa, 1980) alternatively suggests the use of structural regression models for the analysis of longitudinal panel data. This approach was applied in the present study. For a pair of variables, x and y, the causal influence from x to y is represented by the regression parameter of the path from x at time 1 to y at time 2. In like manner, the causal influence from y to x is represented by the regression parameter of the path from a prior y to a subsequent x. Thus, where:

$$x_2 = \beta_0 + \beta_1 x_1 + \gamma_2 y_1 + u, \text{ and}$$

$$y_2 = \gamma_0 + \beta_2 x_1 + \gamma_1 y_1 + v$$

the parameters β_1 and γ_1 represent the time-lagged influence of a variable on itself and β_2 and γ_2 represent the time-lagged causal effects between x and y. Under the usual assumptions governing regression analysis (linearity, additivity, etc.), a nonzero value of a relevant parameter is indicative of a significant causal effect.

Static and cross-lagged analyses were performed to test the relationships between citizenship behavior and each of the separate facets of satisfaction, as well as with a summated measure of overall satisfaction.

Table 1
Means and Standard Deviations at Time 1 and Time 2

	t_1		t_2	
Variable	$\bar{X}$	*SD*	$\bar{X}$	*SD*
Citizenship behavior	142.1	27.3	141.1	27.0
Overall satisfaction	143.5	28.3	138.0	29.4
Work	36.3	8.7	34.1	8.4
Co-workers	42.4	9.9	41.6	8.4
Supervision	42.0	10.6	41.2	10.1
Promotions	10.4	7.6	8.9	7.4
Pay	13.0	5.8	12.3	6.1

Table 2
Static Correlations (t_1 and t_2) Between Facets of Job Satisfaction and Citizenship Behaviors

	Job Satisfaction											
	Work		*Co-worker*		*Supervision*		*Promotions*		*Pay*		*Overall*	
	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2
Citizenship behaviors	.09	.19*	.24*	.18	.46**	.36*	.37**	.40**	.16	.25*	.41**	.41**

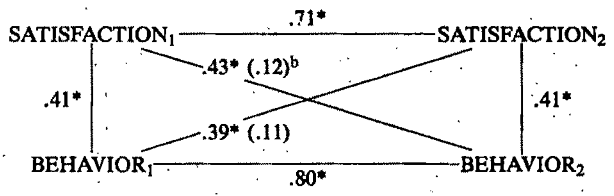
$^{*}p<.05$
$^{**}p<.01$

Results

Table 1 presents descriptive statistics for the study variables at both times surveyed. Table 2 then shows the static correlations between citizenship behaviors and the specific facets of satisfaction. There are indications that each dimension of job satisfaction may be positively related to citizenship behavior, with two facets—supervision and promotional opportunity—reliably more important than pay, co-workers, and the work itself.

Subsequent cross-lagged analysis was conducted between citizenship behavior and each measure of satisfaction. The patterns of relationships were virtually the same in all instances. As a summary example, Figure 1 displays the cross-lagged analysis surrounding the relationship between job related citizenship behaviors and overall job satisfaction. The test-retest reliabilities are fairly high for both variables. Both static correlations are positive and strongly significant and are particularly substantial when compared to most previous studies of the satisfaction-performance relationship. Inspection of the cross-lagged statistics, however, failed to discriminate a single causal direction. Both raw correlations are highly significant, the relative magnitudes are in the predicted direction, and the predicted causal correlation is slightly greater than the two static correlations. However, the two cross-lagged correlations are fairly comparable to one another. Further, both path coefficients (shown in parentheses) are positive, yet much smaller than the correlations; they also are comparable in magnitude to one another and are statistically insignificant.

Figure 1
Cross-Lagged Relationships Between Overall Satisfaction and Citizenship Behaviors[a]



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[a] Cross-lagged patterns of relationships between citizenship behavior and specific facets of job satisfaction reveal essentially the same results as overall satisfaction. These data are available from the first author on request.

[b] Path coefficients are in parentheses.

*$p < .001$

Thus, evidence for the predicted direction of causality was not obtained. However, the results do reliably suggest that job satisfaction is indeed strongly and positively related to a "citizenship" dimension of role performance.

Discussion

The statistical relationships obtained here between general job satisfaction and the aggregate measure of citizenship behaviors are considerably stronger than those typically reported between satisfaction and "performance." Of course, the sample size (77) limits the confidence that one could attach to comparisons between correlations. However, when the 95 percent confidence intervals are computed for the correlations involving overall satisfaction and satisfaction with supervision, the lower limits of these intervals (.15-.26) still exceed the *r* of .14 from Vroom's (1964) review (the upper limits of the confidence intervals range from .54 to .62).

The stronger relationship found here may be because the citizenship behaviors of interest here generally represent actions more under the volitional control of workers than conventional productivity measures. Prosocial gestures are less likely to be constrained by other situational forces, and they pose very little in the way of ability requirements.

Consider, for example, Smith's (1977) study, which found that job attendance on a given day was predicted by satisfaction much more strongly in a location hit by a severe winter storm than in a different location experiencing clement weather. In extremely bad weather, absence is somewhat more defensible than usual; to attempt to show up for work becomes more a matter of intent. This attenuation of the situation force "requiring" attendance allows more variance of the behavior in question and increases the likelihood that such variance can be attributed to "internal" (i.e., attitudinal or dispositional) forces. It might be added that the act of struggling through bad weather to report to work represents more of a prosocial, citizenship gesture than does attendance on other days, and it probably is more likely to be valued and appreciated by responsible officials.

A second reason for the unaccustomed strength of the attitude-behavior relationship found here probably derives from the broad array of citizenship gestures sampled by the behavioral measure. As Fisher (1980) has appropriately pointed out: attitude-behavior linkages are attenuated if the specificities of the constructs are not matched; narrowly defined attitude measures are more predictive of their corresponding specific behaviors than of general measures of behavior; and global measures of affect or mood predict aggregative measures of broadly sampled behaviors better than does any single behavior. Too often the interpretation of results from studies of satisfaction and performance has not taken into account the imbalance between generalized attitude measures and a measure of a very narrowly conceived facet of job behavior (e.g., quantity and/or quality of task performance). The results of this study demonstrate that general *patterns* of employee behavior, rather than a single-act productivity criterion, are predictable from a general measure of satisfaction.

However, the strength of the static relationships found here did not pass the test of causal inference; the cross-lagged differentials were not reliable. Why was a causal connection between satisfaction and citizenship behaviors not supported? One possible explanation concerns the time interval (six weeks) chosen. Conceivably, this was too short an interval for a functional relationship to manifest itself. The current state of conceptual and empirical work in this area offered no clear cues as to what the appropriate interval might be. Research in another area (leadership) indicates the appropriateness of relatively short time lags (Sims & Szilagyi, 1979), suggesting that the six-week interval is not inherently weak methodologically. However, the test-retest correlation of the time 1 and time 2 behavioral measures was .80, approaching the limit set by the internal reliability of the measure itself. With such stability, then, behavior at time 2 was best predicted by behavior at time 1, with initial job satisfaction unable to add significantly to prediction.

Kenny (1975) states that failure to find a significant cross-lagged differential means that one cannot reject the null hypothesis of spuriousness, that is, cannot rule out the possibility that the variables are correlated because of their dependence on a common antecedent variable. In this case, any such "spuriousness" does not originate from common-method variance. The citizenship measure came from a respondent (the supervisor) independent of those who reported their satisfaction; thus the "same-source" problem does not apply.

Supervisory behavior—especially that generally described as "supportive" or "considerate"—could represent a common cause. It has been well established that considerate supervision affects job attitudes, even when attitudes are indexed by nonself-report measures—for example, turnover (Fleishman, 1973). Perhaps supportive supervision also elicits citizenship behaviors, independently of its effects on job satisfaction.

Personality, or some dimension of stable individual differences, also could account for the covariance between mood and citizenship. The literature does not offer either a consistent or a precise clue as to what dimension(s) might be reflected here, but one could well imagine that certain temperaments (e.g., low vs. high neuroticism) determine characteristic affective tone as well as one's generalized orientation to prosocial gestures.

The strength of the relationships found in the present study—compared, say, to the .14 reported by Vroom (1964) to be the mean satisfaction/job performance correlation—coupled with the problem of stabilities that may have precluded causal demonstrations, suggests future work with longer time lags (and larger sample sizes, which will enhance the power of the causal tests and enable a more discriminatory factor analysis on the citizenship scale). Additionally, ratings of behavior could be obtained from observers other than the supervisor, including co-workers. If the relationship is more convincingly shown to be spurious, it would seem that a more fully mapped causal model is needed. Such a model should incorporate some identifiable environmental and personality variables in order to account adequately for the connections between satisfaction and citizenship behaviors. Moreover, one could better ascertain whether conventional measures of job attitudes, as used here, adequately operationalize the "felt need to reciprocate" invoked by exchange theory as a predictor of behavior.

The resolution of these issues would appear to be worthwhile in view of the practical implications that would ensue. If both citizenship behaviors and affect reflect enduring dispositions, then fairly drastic alterations of the work environment would be needed to effect much change in these variables. If they result from situation-specific causes, then perhaps organizational officials can address them in a proactive posture. And if citizenship behaviors are shown to be causal effects of satisfaction, it would appear that job satisfaction is, in fact, more important to organizations than just in its often-mentioned relationships with absenteeism and turnover. Citizenship behaviors represent a multiple-observation criterion, which not only is of potential value to managers and organizations but also can contribute to less restrictive organizational research (by expanding the number of outcome variables that are studied) and thereby provide for broader understanding of employee behavior.

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Exit, Voice, Loyalty, and Neglect as Responses to Job Dissatisfaction: A Multidimensional Scaling Study[1]

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This study focuses on workers' responses to job dissatisfaction. It is suggested that four theoretical categories—exit, voice, loyalty, and neglect—characterize a diverse group of more specific behaviors (e.g., turnover, absenteeism, lateness, talking to supervisor, requesting a transfer). A multidimensional scaling analysis (MDS) of collected data supports the categories.

A fruitful trend in recent research has been the linking of job satisfaction and its rich research tradition to specific work behaviors. It is now documented that low job satisfaction is related to high turnover (Mobley, Horner, & Hollingsworth, 1978; Porter & Steers, 1973; Price, 1977; Vroom, 1964). In addition, low job satisfaction is a major correlate of low commitment (Mobley et al., 1978). Low commitment has been recently linked to high absenteeism (Hammer, Landau, & Stern, 1981). Other behaviors that have been tentatively linked to job dissatisfaction include: requests for transfers (Todor, 1980; Todor & Dalton, 1982); lateness (Adler & Golan, 1981; Farrell & Robb, 1980); error rates (Petty & Bruning, 1980); and internal political activity (Farrell & Petersen, 1982). Given Staines and Quinn's (1979) recent finding that job satisfaction has fallen and continues to decline among U.S. workers, it is imperative that research focusing on the outcomes of job satisfaction and dissatisfaction continue. The research reported below attempts to advance the study of job behaviors (a) by summarizing

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and organizing the research dealing with specific responses to dissatisfaction in a theoretically integrated model and (b) by testing the proposed model.

Existing studies of specific behavioral responses to low job satisfaction occasionally have included more than one response, usually absenteeism and turnover (Behrend, 1953; Porter & Steers, 1973; Steers, 1977). To date, the major theoretical construct used to organize and relate these behaviors has been "job withdrawal behavior" (Adler & Golan, 1981; Beehr & Gupta, 1978; Bernadin, 1977). It recently has been argued (Mobley, 1982) that applying the label "withdrawal" to describe turnover, absenteeism, and other behaviors may be inappropriate. Withdrawal has a strong connotation of escape and avoidance which is "clearly not descriptive of all turnover and absenteeism behavior" (Mobley, 1982, p. 115). Alternatives to the withdrawal approach might take a more neutral view, considering responses to job dissatisfaction as choices among many behavioral options. Finding the right definition and describing the relationships among the behaviors may involve more complex concepts than the unidimensional withdrawal construct.

Recognition of the wide range of options or possible responses to job dissatisfaction can be credited in part to Albert Hirschman in his seminal work, *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations and States* (1970). Hirschman's unconventional concern was with identifying "repairable lapses" (1970, p. 1) in the performance of various institutions. He argued that some deterioration in the rationality, efficiency, and functioning of organizations is inevitable, occurring as a result of "unspecified random causes" (1970, p. 4). The activities and behaviors that members engage in as responses to these dissatisfying periods can be a route by which management finds out about its failures (Hirschman, 1970). Attention to these expressions of dissatisfaction not only helps to guide the organization but also may prevent further decay in the firm because some responses to dissatisfaction are themselves additional forms of decline.

The theory of exit, voice, and loyalty suggests at least three possible options as responses to dissatisfaction. The first response is exit. Exit is equivalent to voluntary separation or turnover from the job. Members may either leave the job and the firm or, as Todor (1980) has noted, seek a transfer within the same organization as a means of leaving the dissatisfying job. The "painful decision to withdraw or switch" (Hirschman, 1970, p. 81) requires considerable effort by the employee and usually means that the employee believes the situation is unlikely to improve. The exit option is regarded as uniquely powerful and expected to produce a "wonderful concentration of the mind" for the abandoned employer (Hirschman, 1970, p. 21).

Hirschman also contributed to organizational behavior by identifying a political response to job dissatisfaction: the "voice option," defined as "any attempt at all to change rather than to escape from an objectionable state of affairs" (1970, p. 30). Voice usually involves appeals to higher authorities either inside or outside of the managerial hierarchy, but it also may involve other actions and protests. When used in political systems, voice is known as interest articulation. In a theory of organizational behavior emphasizing the repair of deteriorating conditions and the return to previous levels of performance, voice is a key concept. According to Hirschman, voice is a legitimate recuperative mechanism, very likely to be active when members have substantial involvements. Steers and Mowday (1981), elaborating the early work of March and Simon (1958), have suggested that attempts to change unfavorable job situations should occur in many cases prior to exit.

The third category suggested by Hirschman (1970) is loyalty. When confronted with deteriorating conditions in the organization, some members choose neither exit nor voice; rather, they stick with the firm for a period of time before reacting to the problem, if at all. They "suffer in silence, confident that things will soon get better" (Hirschman, 1970, p. 38). As Hirschman notes, however, most loyalist behavior retains an enormous dose of reasoned calculation; "an individual member can remain loyal without being influential himself, but hardly without the expectation that *someone* will act or *something* will happen to improve matters" (1970, pp. 78-79). Loyalist behavior may constitute an independent course of action between exit and voice or it may be a transitory form giving way to other behaviors as the situation continues. From the organization's point of view, sustained action in the face of temporary difficulty or a decline in rewards is highly desirable. Thus workers seeking advice find that loyalty is an often suggested course of action.

Dissatisfaction with one's job also may result in lax and disregardful behavior. Hirschman (1970) did not explicitly address this possibility, but two subsequent expositions (Kolarska & Aldrich, 1980; Rusbult, Zembrodt, & Gunn, 1982) have identified this option. In a consumer application of this theory stressing dissatisfaction with products, the fourth response was customer silence and inaction (Kolarska & Aldrich, 1980). In a study of romantic involvements, generally inattentive behavior, such as lack of caring and staying away, was termed neglect (Rusbult et al., 1982). Neglect aptly describes lax and disregardful behavior among workers. Examples of such behavior recently associated with either low job satisfaction or low commitment include: lateness (Adler & Golan, 1981; Angle & Perry, 1981; Farrell & Robb, 1980); absenteeism (Hammer, Landau, & Stern, 1981); and error rates (Petty & Bruning, 1980). Temporary abandonment and psychological inattention can be monitored and identified as responses to dissatisfaction. When appropriate, they can serve to warn management of lowered organizational effectiveness.

The approach derived from Hirschman—exit, voice, loyalty, and neglect (EVLN)—may be a useful conceptual framework for analyzing the relationships among responses to job dissatisfaction. The first step is to examine the cognitive structure that workers use to organize their behavioral options. Do workers consider absenteeism to be similar to quitting, or is absenteeism viewed as an alternate response to job dissatisfaction?

The EVLN model suggests that workers make decisions and select options much differently than has been suggested by the job withdrawal model.

A technique that has been useful in uncovering cognitive structures and underlying dimensions in individual choice problems is multidimensional scaling (MDS). MDS recently has been employed to study cognitive structures underlying workers' perceptions of work outcomes (Billings & Cornelius, 1980) and has been used to study choice among behavioral options in charitable donations (Kessler, 1978). What MDS does is provide a geometric interpretation, a logical translation using space coordinates, to describe an underlying cognitive structure. The resulting "map" allows for the identification of the degree of similarity and difference in workers' perceptions of response options.

In addition to providing a spatial configuration, MDS also indicates attributes or characteristics that best interpret the theoretical meaning of the dimensions. For example, Hirschman (1970) suggested that a constructive/destructive distinction could be made among the responses to dissatisfaction. Exit, being silent, does not always stimulate recuperative mechanisms, but voice alerts management to problems and therefore is constructive. Responses to dissatisfaction and power strategies aimed at increasing satisfaction have been variously characterized by other authors as: active/passive (Angle & Perry, 1981); rational/nonrational (Kipnis, Schmidt, & Wilkinson, 1980); and direct/indirect, masculine/feminine, and unilateral/bilateral (Falbo & Peplau, 1980). Each alternative characterization or attribution draws attention to different theories and indicator variables. Assigning meaning to the dimensions underlying the response groups gives direction to a predictive theory of responses to dissatisfaction.

In order to explore the usefulness of the EVLN model for understanding responses to job dissatisfaction, an MDS study was developed. The first general hypothesis was that four response groups or a two-dimensional MDS space would describe a range of behavioral responses to dissatisfaction. Second, the study was designed to assign meanings to the dimensions of the cognitive space. The six scales described above (e.g., constructive/destructive) were entered into the analysis for interpretation of the dimensions. The hypothesis for these scales was that they would provide a statistically adequate interpretation.

Methods

Subjects

This study utilized a panel of experts and two nonexpert subject groups. The panel of experts ($N=7$) consisted of academic and business affiliated specialists in the areas of organizational behavior and human resource management. The first subject group ($N=185$) provided MDS similarity judgments. The second subject group ($N=31$) provided data to interpret the meanings of the obtained dimensions. All the nonexpert subjects were enrolled in graduate business courses in the evening. These subjects were employed as supervisors, engineers, or in other white collar occupations and represented a diverse group of organizations. For these two groups the average subject had completed 17.4 years of school and was 32.2 years of age. The sample was 63.2 percent male.

Procedure

The data necessary for this MDS study were collected in three ways: (1) a panel of expert judges ($N=7$) sorted 12 specific behavioral responses to job dissatisfaction into perceived categories; (2) nonexpert subjects ($N=185$) made paired similarity ratings of the same 12 job behaviors; (3) a second set of nonexpert subjects ($N=31$) rated each of the 12 responses to dissatisfaction on 6 attribute scales.

Measurement

As potential concrete examples of the four theoretical categories (i.e., exit, voice, loyalty, and neglect), 12 job behaviors were selected. These examples were selected to include the range of options suggested by both the withdrawal and EVLN theories. The potential operationalizations of exit were: "getting into action and looking for another job," "deciding to quit the company," and "getting him/herself transferred to another job." Possible voice referents were: "talking to the supervisor to try and make things better," "putting a note in the suggestion box hoping to correct the problem," and "writing a letter to a government agency to find out what can be done to help the problem." Loyalty behaviors considered were: "waiting patiently and hoping the problem will solve itself," "quietly doing one's job and letting higher ups make the decisions," and "saying nothing to others and assuming things will work out all right." Neglect also had three forms: "calling in sick and not dealing with what's happening," "coming in late," and "becoming less interested and making more errors."

The validity of the 12 referents as operationalizations of the 4 constructs was assessed by asking the panel of experts to perform a card-sorting task. The experts were given 12 cards, each containing 1 referent, and were asked to sort "into the same stacks all the things that seem to belong together, or relate to some hypothetical underlying construct you perceive." No information was provided about the number of hypothesized constructs. Of the 7 judges, 6 sorted the 12 referents into 4 groups with 3 referents each, matching the theoretical model. One judge sorted the 12 referents into 3 categories of uneven sizes; the largest (5 items) including most of the exit and neglect items (i.e., deciding to quit, looking for another job, applying for a transfer, calling in sick, and coming in late). "Becoming less interested and making mistakes" was sorted, by this judge, with the three loyalty items.

To assess validity further, the expert judges were asked to provide "names" or short descriptions for the categories they developed. A wide variety of descriptions were provided. The most concise description offered escape, resolve, accept, and avoid as alternative labels of the EVLN constructs. Exit was variously termed as leaving, withdrawal, or escape; and voice was termed problem solving, suggesting improvements, or reforming the system. The loyalty items also were categorized in a variety of ways including acceptance, faithfulness, loyalty, trust, and latent passive behavior. Neglect descriptions included temporary withdrawal, hostility, avoidance, quitting on the job, and manifest passive behavior. The expert who sorted to three categories termed his as avoidance, passive disengagement, and involvement.

The similarity comparison task used the same 12 descriptions of the responses to job dissatisfaction. Of these 12 descriptions, 4 were presented as targets, in random order, for similarity comparisons against lists of the remaining 11 options; thus each subject made 44 paired comparisons. Responses were scored using a 9-point similarity scale anchored 1 = extremely dissimilar, 9 = extremely similar. The standard instructions for this task included a hypothetical similarity problem using cities. Subjects were paid $1 for their participation.

To provide for the interpretation of MDS dimensions, the second subject group rated each of the 12 response options on 6-attribute scales: active/passive, masculine/feminine, constructive/destructive, direct/indirect, rational/nonrational, unilateral/bilateral. Attribute ratings were made on 9-point semantic differential scales anchored with the paired terms of the attribute scales. Each of the 12 responses was rated on each of the 6 possible attribute pairs. Each attribute rating was preceded by an instruction: "Rate each of the following behaviors or tactics based on how ________/________ you feel this response is to job dissatisfaction." These subjects were also paid $1 for their participation.

Analysis

The analysis of the similarity data and the attribute rating task involved five steps; four for the determination of the MDS map and one for the interpretation of the MDS dimensions. The first step was to process the obtained similarity judgments of the first group ($N = 185$) into a matrix of mean similarity judgments (for a discussion, see Kruskal & Wish, 1978). Next a nonmetric MDS analysis (MDSCAL) was used to determine the number of dimensions needed to describe the data optimally. Stress values, that is, the square roots of the normalized residual sum of squares, were used as the selection statistic. Third, the data set was split by experimental sessions into equivalent halves (three experimental sessions per "half"), and convergent and divergent correlations were computed. The fourth step was the calculation of the space coordinates for the complete data set. Coordinate values are produced automatically by MDSCAL once the number of dimensions is determined. The fifth step, the interpretation of the dimensions, was accomplished using multiple regression. The attribute ratings of the second group ($N=31$) for each of the 12 behavioral responses were inserted into the obtained geometric space (called projecting vectors), using the least squares method developed by Young, de Leeuw, and Takane (1976). This projection method treats each response to dissatisfaction as a case, uses the mean score on an attribute scale as the value for the dependent variable, and uses the MDS coordinates for that case as predictor scores. The vectors' placement and direction, as well as the size of the regression coefficients, suggest the interpretations of the MDS map.

Results

Determination of Dimensions

MDSCAL uses an iterative computational procedure to minimize stress systematically and in so doing it indicates how many dimensions are needed to describe the data. Determining a sufficiently small stress value is accomplished by observing decreases in stress values over successively greater numbers of dimensions. When the decreases in stress values level off, or an "elbow" is formed if a plot is used, the correct number of dimensions is indicated. In this analysis the stress for one dimension $=.265$, two dimensions $=.010$, three dimensions $=.015$, four dimensions $=.010$, and five dimensions $=.010$. The largest decrease in stress occurs when the second dimension is added. The additional dimensions do not decrease stress. The three-dimensional solution in fact increases stress.

It has been suggested (Billings & Cornelius, 1980), that a dimensional solution should meet tests of convergence and divergence. Table 1 presents split-half correlations for the two-dimensional solution. Table 1 shows high convergence for both dimensions I ($r=.992$) and dimension II ($r=.993$). The largest divergent correlation, by contrast, is $r=.228$.

Table 1
Correlation of Dimensions:
Split-Half Convergence and Divergence

	Dimensions			
	I_1[a]	II_1	I_2[b]	II_2
Dimension I_1	—			
Dimension II_1	.187	—		
Dimension I_2	.992	.228	—	
Dimension II_2	.139	.993	.169	—

[a] $n=85$; [b] $n=100$.

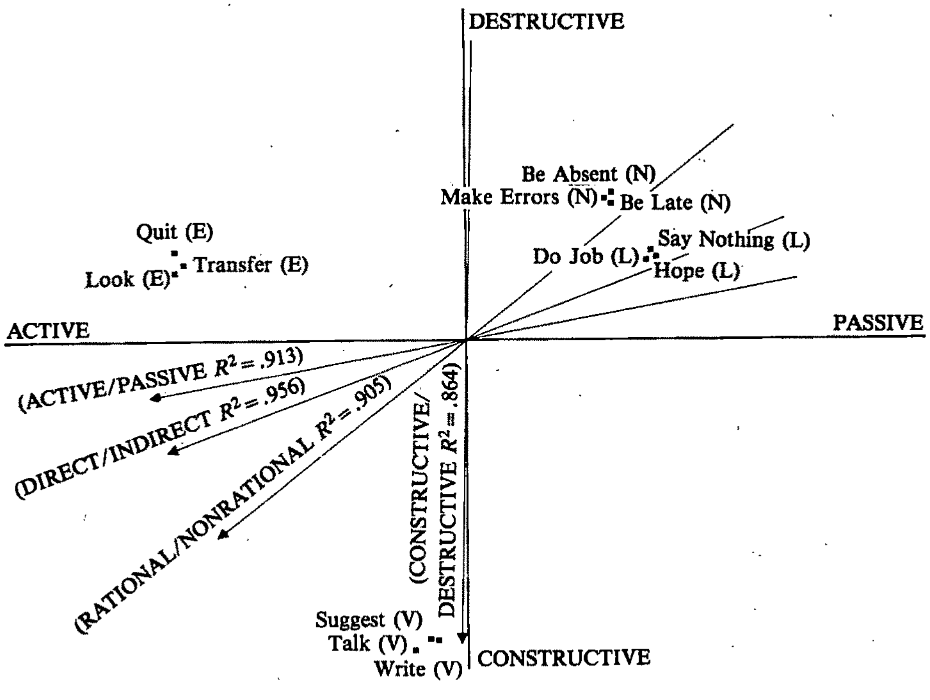
Response Configuration

The normalized projections for the 12 responses to dissatisfaction are presented in Table 2. Graphic representations of the outcomes are plotted in Figure 1. Four clusters are discernable in the table and figure. A good

Table 2
Locations of 12 Responses to Dissatisfaction in a Two-Dimensional MDSCAL Solution
($N = 185$)

Symbol	*Response*	*Type*	*Dimension* *I*	*Dimension* *II*
Talk	Talking to supervisor to try and make things better	(voice)	-.207	-1.200
Hope	Waiting patiently and hoping the problem will solve itself	(loyalty)	.745	.320
Be absent	Calling in sick and not dealing with what is happening	(neglect)	.571	.567
Look	Getting into action and looking for another job	(exit)	-1.136	.267
Suggest	Putting a note in the suggestion box hoping to correct the problem	(voice)	-.149	-1.155
Do job	Quietly doing one's job and letting higher ups make the decisions	(loyalty)	.701	.303
Be late	Coming in late to avoid some problems	(neglect)	.573	.527
Quit	Deciding to quit the company	(exit)	-1.140	.346
Write	Writing a letter to a government agency to find out what can be done	(voice)	-.114	-1.158
Say nothing	Saying nothing to others and assuming things will work out	(loyalty)	.725	.345
Make errors	Becoming less interested and making more errors	(neglect)	.535	.542
Transfer	Getting him/herself transferred to another job	(exit)	-1.104	.297

Figure 1
MDSCAL Configuration of Responses to Job Dissatisfaction and Four Vectors Representing Attribute Ratings



indication of a cluster is the agreement of the signs for both coordinates. In the exit cluster, looking for another job (-1.136, .267), deciding to quit (-1.140, .346), and trying to get transferred (-1.104, .297) all have the same sign pattern and similar coordinate values.

The voice, loyalty, and neglect measures also cluster as hypothesized. Table 2 shows the coordinates and signs for these three clusters and indicates close agreement with the general hypothesis. Although all four clusters are distinct, the location of the loyalty cluster in the MDS space is not exactly as expected. All three loyalty items are situated in the same quadrant as the neglect cluster. The loyalty cluster should have appeared in the lower adjacent quadrant.

Projecting Vectors

Figure 1 also presents four vectors from the attribute scales projected into the two-dimensional space. The location and direction of each vector relative to each response tells how the second subject group characterized the behaviors. Each vector in Figure 1 is also tagged with its coefficient of determination (R^2). Only those for which R^2 is above .70 are plotted and considered as meaningful interpretations (Kruskal & Wish, 1978). The data for the remaining scales and the exact coordinates of all vectors are contained in Table 3. Positions of vectors and R^2 values provide descriptions of the MDS space. Dimension I (the X axis) is well interpreted by the active/passive scale. The 12 responses are sorted on this dimension with 91.3 percent ($p \leq .001$) of the variance explained. Exit and voice behaviors are active responses and loyalty and neglect are passive responses to dissatisfaction.

Table 3
Standardized Regression Coefficients of the Six Hypothesized Attribute Scales

				Beta	
	R	R^2	p^a	*I*	*II*
Active/passive	.955	.913	.001	-.910	-.165
Masculine/feminine	.827	.684	ns	.840	-.219
Constructive/destructive	.930	.864	.01	-.017	-.927
Direct/indirect	.978	.956	.001	-.866	-.317
Rational/nonrational	.951	.905	.001	-.694	-.532
Unilateral/bilateral	.821	.675	ns	-.184	-.768

[a] $df = 2, 29$.

The second dimension is best explained by the constructive/destructive scale ($R^2 = .864$, $p \leq .01$). Voice is identified as the most constructive response to job dissatisfaction. Exit, neglect, and loyalty are characterized in this study as destructive responses to dissatisfaction. Although the coordinates in Table 2 show loyalty as slightly less destructive than exit and neglect, the finding is unexpected; Hirschman (1970) characterized loyalty as constructive. Taking the dimensions together, voice is active and constructive, exit is active and destructive, loyalty is passive and somewhat destructive, and neglect is passive and destructive.

Discussion

This study finds that a diverse group of specific behavioral responses to job dissatisfaction can be subsumed by four more abstract theoretical categories. These categories are tentatively labeled exit, voice, loyalty, and neglect (EVLN). These four response models are described by two conceptual dimensions—active/passive and constructive/destructive. Taken as a group, these findings indicate that job dissatisfaction responses are diverse and complex, but that the potential for abstract integrated theory exists. These preliminary findings suggest that the EVLN model should be a useful typology for building predictive theories.

The findings of this study extend earlier research and theories. Porter and Steers (1973) and more recently Mobley (1982) have criticized the generalized withdrawal approach and have offered contingency theories as alternatives. The separation of turnover and absenteeism in the MDS analysis is consistent with the criticisms of withdrawal theory. Steers and Mowday (1981) suggested that job dissatisfaction could lead to attempts to change the work environment either prior to or as an alternative to turnover. The findings regarding voice are consistent with Steers and Mowday's (1981) model of voluntary turnover. It is noted that some anomalous findings in the generalized withdrawal tradition are reconciled by this research. Adler and Golan (1981) and Farrell and Robb (1980) sought to include lateness in the withdrawal construct. Both studies found lateness to be related to absenteeism but not to turnover. Troubling in the original context, the EVLN model interprets these relationships. Considering these new findings, the casual withdrawal grouping (Price, 1977) and its dependence on correlational analyses (Mobley, 1982) doubtless should be reconsidered.

This study adds to existing research, but care must be taken not to overinterpret the results. The EVLN model offeres an interesting four-way conceptualization of responses to job dissatisfaction, but its theoretical constructs must be considered tentative. The panel of expert judges offered a variety of appellations for the same four clusters of behaviors. Some of the labels were consistent with the EVLN model, and others suggested theories as diverse as operant conditioning and Freudian psychology. Substantiation of the exit, voice, loyalty, and neglect model ultimately will require consistent results of related predictive hypotheses. Further extensions of this model also must respect the unexpected findings of this first test. The location of the loyalty cluster in the passive/destructive rather than passive/constructive quadrant suggests either weak conceptualization or varying expectations in the labor force. It may be that Hirschman's definition of loyalty inadequately grasps the subtleties of loyalist behavior, especially its active forms, or it may be that these subjects, graduate business students, hold unusually high expectations of sacrificing and supporting organizations during lapses in performance. Future studies should consider additional behaviors as possible referents of the loyalty construct and explore the expectations of different subgroups within the organization.

Another limitation of this study is that it does not address all of the possible responses to job dissatisfaction. The EVLN model does not consider, for example, psychological responses such as pathological acceptance of job dissatisfaction or changing comparison standards for job satisfaction. Unusual behaviors, such as accidents and sabotage, from time to time also have been suggested as responses to dissatisfaction and might well be considered again. Furthermore, this study does not deal with the relationship of performance to job dissatisfaction. Staw and Oldham (1978) and Niedzwiedz and Kim (1982) have suggested interesting contingency relationships that could be integrated with the findings of this study. Although the EVLN model adds insight about responses to job dissatisfaction, it does not exhaust the possible responses. Expanding the model may be a profitable strategy in future studies.

New behaviors as responses to job dissatisfaction and new relationships among well-researched responses are suggested in this study. The attribute rating data provide a first step for the development of predictive theories. Future research should focus on the individual, organizational, and environmental determinants of each of the EVLN clusters. Scholars concerned with these behaviors would be well served by examining Hirschman's (1970) work in detail. They will find many insightful theoretical statements concerning, for example, the effects of high initiation costs on voice, the effects of bad alternatives on exit, and the time that voice is most effective. These statements can be translated easily into researchable hypotheses.

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Phases of the Mentor Relationship[1]

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The mentor relationship can significantly enhance development in early adulthood and also in the midcareer stage of the more experienced individual. A conceptual model derived from an intensive biographical interview study of 18 relationships in one corporate setting is presented to highlight the successive phases of this developmental relationship.

An individual who is entering the adult world and the world of work is likely to encounter a variety of developmental tasks that are reflected in concerns about self, career, and family (Bray, Campbell, & Grant, 1974; Gould, 1978; Hall, 1976; Levinson, Darrow, Klein, Levinson, & McKee, 1978; Schein, 1978; Super, 1957; Vaillant, 1977). A mentor relationship can significantly enhance development in early adulthood by facilitating work on these tasks (Clawson, 1980; Dalton, Thompson, & Price, 1977; Levinson et al., 1978). The mentor provides a variety of functions that support, guide, and counsel the young adult as this important work is accomplished.

Adult development perspectives suggest that the primary task of early adulthood is one of *initiation*, and the primary task of middle adulthood is one of *reappraisal*. Through a presentation of a conceptual model derived from empirical study, it will be demonstrated that the mentor relationship has great potential to facilitate career advancement and psychosocial development in both early and middle adulthood by providing a vehicle for accomplishing these primary developmental tasks. In addition, it is argued that the potential value of a mentor relationship is limited and that, indeed, a relationship of this kind can become destructive.

Theoretical Review

A young adult, in the first stage of his or her career, is likely to be engaged in forming an occupational identity, forming a dream, forming intimate

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relationships, and forming a mentor relationship (Levinson et al., 1978). It is a time when questions about one's competence, one's effectiveness, and one's ability to achieve future dreams are most salient. Erikson (1963, 1968) describes the primary tasks of this era in terms of two polarities that become the focus of attention for the young adult: "role identity versus role confusion" and "intimacy versus isolation." Alternatively, the primary tasks of this era are stated in terms of the individual's relationship to the organization in which s/he is working. Learning the ropes of organizational life encompasses the development of requisite technical, interpersonal, and political skills, as well as a sense of competence in a particular work context or occupation (Berlew & Hall, 1966; Hall, 1976; Schein & Van Maanen, 1977; Webber, 1976). Thus the young adult is likely to seek relationships at work that provide opportunities for resolving the dilemmas posed in early adult and career years.

In contrast, the more experienced adult at midlife and/or midcareer is likely to be in a period of reassessment and reappraisal during which time past accomplishments are reviewed, and one is confronted with the challenge of readjusting future dreams and coming to terms with past accomplishments (Gould, 1972, 1978; Jung, 1933; Levinson et al., 1978; Neutarten, 1968; Osherson, 1980; Sofer, 1970; Vaillant, 1977). It has been suggested that this period of life can be extremely difficult as one realizes that life is half over and one's career has been fairly well-determined (Dalton, 1959; Jacquest, 1965; Sofer, 1970). For those who find themselves with no further advancement or growth opportunities, this time of life can be particularly troublesome (Hall & Kram, 1981; Levinson, 1976).

Entering a developmental relationship with a young adult provides an opportunity at midlife to redirect one's energies into creative and productive action that can be responsive to these salient concerns. The Eriksonian polarity at this life stage, "generativity versus stagnation," suggests the potential value of a mentor relationship. Through enabling others, the midlife individual satisfies important generative needs (Erikson, 1963, 1968, 1978) and also has the opportunity to review and reappraise the past by participating in a younger adult's attempts to face the challenges of early adulthood. Individuals may feel challenged, stimulated, and creative in providing mentoring functions as they become "senior adults" with wisdom to share; alternatively, they may feel rivalrous and threatened by a younger adult's growth and advancement.

There is considerable agreement among those who have studied mentoring that in order to understand fully the nature and impact of this developmental relationship, it is necessary to examine how it changes over time (Clawson, 1979; Davis & Garrison, 1979; Kram, 1980; Levinson et al., 1978; Missirian, 1982; Phillips, 1977). Levinson et al. (1978) acknowledge that more often than not, a mentor relationship ends with considerable ambivalence and anger, with both gratitude and resentment; and that, much like a love relationship, a battle occurs at termination of the relationship that enables mentor and protégé to separate and to move into new relationships that are appropriate to their current developmental needs. Although Levinson et al. (1978) allude to changes in the nature of the mentor relationship over time, these are not explicitly discussed in their work.

Missirian (1982) and Phillips (1977) have made a further contribution, in their studies of female managers, by delineating phases of the mentor relationship. However, both of these models were derived from retrospective accounts of managers who described relationships from earlier in their careers, presenting the possibility of distortion in the data because of faulty recall. Second, they were derived from one perspective of the relationship, rather than from personal accounts of both parties of the relationship. Thus, they do not clearly delineate how the relationship benefits the mentor, but only how it benefits the younger individual. Third, these phase models are based solely on interviews with female managers, limiting the generalizability of the findings to a particular population that does not include the many mentor relationships that involve men. Finally, and perhaps most importantly, these studies, though illuminating what generally occurs in the mentor relationship, fail to identify the factors that cause a relationship to move from one phase to the next.

The conceptual model presented in this paper clarifies the phases of a mentor relationship by systematically delineating the psychological and organizational factors that cause movement from one phase to the next. In addition, the conceptualization, derived from an intensive biographical interview study of *pairs* of managers, makes the experiences of both individuals explicit, highlighting how both can be beneficiaries of the relationship. This dynamic perspective illuminates the manner in which the mentor relationship unfolds over time as well as how each individual influences and is influenced by the relationship at each successive phase.

Research Method

This research is based on the study of 18 developmental relationships as they are occurring. Pairs of younger and older managers involved in significant relationships with each other were interviewed at length about their relationships with each other. Thus it is a study of *pairs* of managers involved in relationships that *currently* are affecting each manager's development. In addition, these 18 relationships are in *different* phases.

Methodological decisions were guided by the premise that an appropriate research strategy emerges from careful consideration of the interaction of the problem, the method, and the person-researcher (Reinharz, 1979). The exploratory nature of the research problem suggested the need for a flexible data collection method that would encourage unpredicted aspects of the phenomenon to surface (Filstead, 1970). The emphasis on individuals' subjective experience of the relationship as the primary data for understanding the relationship's essential characteristics required in-depth clinical interviewing of a small number of individuals so that sufficient time could be spent exploring the relationship at length by obtaining personal accounts from each member of the pair. Finally, a method was chosen that fostered a research relationship of considerable intimacy during the joint task of exploring the meaning of the relationship in an individual's career history so that valid information could be obtained and mutual learning for both investigator and participant could occur.

Setting and Sample

The research was conducted in a large northeastern public utility of 15,000 employees. The management population consists of managers in a hierarchical structure with 2,000 at first level management, 1,000 at second level, 250 at third level, 55 at fourth level, and 25 in top management. Young managers between the ages of 25 and 35 who had three or more years of tenure in the organization and who were at first, second, or third levels of management were identified as the central target population. Theories of adult development and career development suggested that this group represented the population for which the need for mentoring would be greatest; if developmental relationships existed at all, they most likely would exist in this group.

Interviews with a random sample of 15 young managers who met the above criteria for selection into the research pool resulted in the identification of only 3 developmental relationships. Because theoretical sampling is more important than statistical sampling in an exploratory qualitative study (Glaser & Strauss, 1967), a decision was made to obtain recommendations from personnel staff of young managers who they believed had developmental relationships. This recruitment process allowed for several exploratory questions in the interview, which resulted in identification of 12 more young managers who had mentors. Three of the young managers each reported two developmental relationships, thus accounting for 18 relationships studied.

The young managers range in age from 26-34 with an average age of 31.3 years (see Table 1). They have been working in the organization for an average of 9.2 years. Eight of the young managers are male, and seven are female. They currently are in second or third level management positions. The senior managers range in age from 39 to 63, with an average age of 47. They have been working for the organization for an average of 23 years. Two of them have recently left the organization. All but one of the senior managers are male. Three of the senior managers are at third level management, the remainder are at fourth level or above. At the time of the interviews, 11 of the 18 relationships were direct reporting relationships; however, 4 of them involved an indirect reporting relationship (separated by two levels of the management hierarchy) in an earlier phase.

Interview Method

The interview sequence with the young managers consisted of two two-hour sessions. During the first session, the primary task was to review the

Table 1
Sample Description

	Junior Manager			*Senior Manager*			*Relationship*	
Relationship[a]	*Age (in Years)*	*Sex*	*Level*	*Age (in Years)*	*Sex*	*Level*	*Age Difference (in Years)*	*Level Difference*
1	33	M	3	44	M	4	11	1
2[b]	32	M	3	49	M	4	17	1
3[b]	32	M	3	46	M	4	14	1
4	34	M	3	39	M	4	5	1
5[b]	33	M	3	45	M	5	12	2
6[b]	33	M	3	55	M	5	22	2
7	33	M	2	46	M	3	13	1
8	31	M	3	44[c]	M	4	13	1
9	33	M	3	48[c]	M	4	15	1
10	33	M	3	63	M	Retired	30	2
11[b]	32	F	3	41	M	3	9	0
12[b]	32	F	3	44	M	4	12	1
13	30	F	2	44	M	4	14	2
14	31	F	2	44[c]	M	4	13	2
15	26	F	3	48[c]	M	4	22	1
16	28	F	2	47	M	3	19	1
17	31	F	2	55	M	4	24	2
18	30	F	2	42	F	Left company	12	2

[a] In the research sample, relationships varied from less than 2 years to 11 years. At the time of the research study, only one relationship had clearly ended, five relationships were in the cultivation phase, and the remainder had been through one or more phases of separation created by structural job changes and/or significant changes within one or both individuals. The four phases vary in length, and in some instances a recycling occurs through the cultivation and separation phases several times.

[b] Three junior managers had two developmental relationships that were studied. Relationships 2 and 3, 5 and 6, and 11 and 12 each have a junior manager in common. Thus, there are 15 different junior managers in the sample.

[c] Two senior managers were identified as significant others twice. Thus, relationships 8 and 14, and 9 and 15 each have a senior manager in common. Thus, there are 16 different senior managers in the sample.

young manager's career history and to explore relationships with more senior managers that had been important during his or her life in the organization. During the second interview session, the primary task was to explore one or two relationships with senior managers that had been important in the young manager's career. This was accomplished by reconstructing significant events as the relationship unfolded and by following the thoughts and feelings that the young manager expressed as s/he told the story.

The pivotal question at the end of the first interview that identified the relationship(s) that would become the focus of study during the second interview was, "Is there anyone among those that you have mentioned today that you feel has taken a personal interest in you and your development?" In response to this question, the young managers were able to review their feelings and thoughts in order to arrive at a clear statement of the person they wanted to talk about in the second interview. These significant others then were contacted and invited to participate in a parallel interview sequence. The study was introduced to the senior managers by reviewing how they had been mentioned by a young manager as someone who had contributed to his or her development. All of the senior managers contacted were quite willing to participate in interviews about the relationship.

The first interview with each senior manager was parallel to the second young manager interview; the history of the relationship was explored and the senior manager was encouraged to describe his or her experience of the relationship as significant events were identified. The second session of the senior manager interview sequence was devoted to exploring the senior manager's career history. The purpose of this segment was to illuminate how the relationship with the young manager fit into the senior manager's career and, in turn, how the relationship influenced his or her development.

This research method has intervention consequences. Certain efforts were taken to minimize potential negative consequences: careful debriefing at the conclusion of the interview sequence, careful linking processes to the senior managers that insured the confidentiality of all individual interviews, and an invitation, in the feedback report, to research participants to contact the researcher with questions.

Analysis

The primary method of analysis was characterized by an inductive process in which tentative hypotheses concerning developmental relationships were suggested and revised as interviews were conducted. As the number of relationships in the sample increased, themes and categories began to emerge to illuminate recurring patterns in the data. These themes and categories became the basis for the conceptual model of the phases of the mentor relationship. This inductive process, characterized by continuous movement between data and concepts until the time when sufficient categories have been defined to explain what has been observed, is described by Glaser and Strauss (1967) as the "constant comparative method of analysis."

The actual delineation of the conceptual model involved extensive use of illustrative quotations from the case material. This process included intuitively sorting the case material, identifying the organizing concepts, and then clarifying the link between concepts and data through written presentation. An informal test of the usefulness and accuracy of the emergent analysis evolved early in the analysis phase. When case material could not be effectively utilized to illustrate a concept, it was concluded that the concept was inadequate or inappropriate in some way. The more the accounts of managers could stand alone in illustrating the emergent analysis, the more credible was the new conceptual understanding.

Relationship Phases

A mentor relationship has the potential to enhance career development and psychosocial development of both individuals. Through career functions, including sponsorship, coaching, protection, exposure-and-visibility, and challenging work assignments, a young manager is assisted in learning

Exhibit 1
Mentoring Functions

Career Functions[a]	*Psychosocial Functions*[b]
Sponsorship	Role modeling
Exposure-and-visibility	Acceptance-and-confirmation
Coaching	Counseling
Protection	Friendship
Challenging assignments	

[a] Career functions are those aspects of the relationship that primarily enhance career advancement.

[b] Psychosocial functions are those aspects of the relationship that primarily enhance sense of competence, clarity of identity, and effectiveness in the managerial role.

the ropes of organizational life and in preparing for advancement opportunities. Through psychosocial functions including role modeling, acceptance-and-confirmation, counseling, and friendship, a young manager is supported in developing a sense of competence, confidence, and effectiveness in the managerial role (see Exhibit 1). In providing a range of developmental functions, a senior manager gains recognition and respect from peers and superiors for contributing to the development of young managerial talent, receives confirmation and support from the young manager who seeks counsel, and experiences internal satisfaction in actively enabling a less experienced adult to learn how to navigate successfully in the world of work.

Examination of the phases of a mentor relationship highlights the psychological and organizational factors that influence which career and psychosocial functions are provided, and it shows how each manager experiences the relationship at any given point in time. Although developmental relationships vary in length (average length of five years in the research sample), they generally proceed through four predictable, yet not entirely distinct, phases: an *initiation* phase, during which time the relationship is started; a *cultivation* phase, during which time the range of functions provided expands to maximum; a *separation* phase, during which time the established nature of the relationship is substantially altered by structural changes in the organizational context and/or by psychological changes within one or both individuals; and a *redefinition* phase, during which time the relationship evolves a new form that is significantly different from the past, or the relationship ends entirely.

Initiation

Young managers' recollections of the first 6 to 12 months of the relationship suggest that a strong positive fantasy emerges in which the senior manager is admired and respected for his or her comptence and his or her capacity to provide support and guidance. In this fantasy, the senior manager embodies an object for positive identification and is viewed as someone who will support the young manager's attempts to operate effectively in the organizational world. With time, the senior manager's behavior lends credence to these initial fantasies, and the behavior is experienced as inviting and supportive. The young manager begins to feel cared for, supported, and respected by someone who is admired and who can provide important career and psychosocial functions:

> I think being a first job in my career, there were a lot of transitions I was making, and a lot of them were hard.... You know—realizing that you were at the bottom—there were thousands of others like you, and you didn't know everything to start with—wanting to know and not knowing...and wanting challenging work and not getting it....
>
> Yet John, three levels of management away from me—he hired me—and I guess I had the feeling that he believed in me—and that even though I didn't have the right degree, I could still do it.... I had the feeling that in fact there was someone who recognized what I was going through and who had faith in me to make the right decisions.... I was able to do a lot of different projects, work with others, and really get in the know because of him....

Senior managers' recollections of this period suggest that the young manager quickly comes to represent someone with potential, someone who is "coachable," and someone who is enjoyable to work with. A fantasy evolves of someone who can become an object for the transmission of the senior manager's values and perspectives on the world. The young manager is viewed as someone who can provide technical assistance and who can benefit substantially from the senior manager's advice and counsel. Thus the possibility of contributing to the young manager's growth and success is impetus for setting the relationship in motion:

> Karen was the second or third person that came in. I interviewed her and I was completely impressed with her. My assessment of her was that she was a real comer—I tried to give her some advice of sorts as I got to know her—you know, understanding what the company is about...taking her to meetings and giving her the opportunity to present her ideas....
>
> I guess I really get an inner pride, particularly in being someone getting all that respect so fast from other people. It is kind of challenging to help them succeed. The accomplishment is not that I hired them, but that over time other people recognize them as well. That really puffs out your chest a bit. That other people agree with your assessment and judgments.... It's like being in a hall of fame, when they succeed because of your help—maybe you don't get all the applause, but you did a tremendous job!

Initial interactions that create and support positive expectations occur in a variety of contexts, including: a direct hire interview; an informal interaction around common work tasks; and a direct reporting relationship created by unrelated promotional decisions or through recommendation from peers that encourages the senior manager to seek out the young manager as a potential subordinate. Work on common business tasks, recommendations from significant others, and discussions of performance or departmental concerns cause each to develop an increasingly positive expectation of the value of relating to the other. In most cases there is a balance of initiative on both sides: the young manager begins to look towards the senior manager for support and guidance, and the senior manager begins to provide developmental opportunities.

The events of the first year serve to transform initial fantasies into concrete positive expectations. For example, an opportunity to work on a high visibility project is interpreted by the young manager as proof of the senior manager's caring, interest, and respect. Alternatively, a request for assistance or a volunteered criticism of the department is interpreted by the senior manager as proof of the young manager's assertiveness and competence. These interpretations set the relationship in motion and provide the foundation for its movement to a new phase.

Cultivation

During the cultivation phase, lasting from two to five years, the positive expectations that emerge during the initiation phase are continuously tested against reality. As the relationship continues to unfold, each individual discovers the real value of relating to the other. The range of career functions and psychosocial functions characterizing a mentor relationship peaks during this phase.

Generally, career functions emerge first as the senior manager provides challenging work, coaching, exposure-and-visibility, protection, and/or sponsorship. As the interpersonal bond strengthens with time, psychosocial functions emerge. In some instances they include, primarily, modeling and acceptance-and-confirmation. In other instances of greater intimacy, they extend to include counseling and friendship as well. Career functions depend on the senior manager's organizational rank, tenure, and experience, but psychosocial functions depend on the degree of trust, mutuality, and intimacy that characterize the relationship.

A young manager, after two years in a developmental relationship, notes how challenging work assignments, coaching, role modeling, and acceptance-and-confirmation contributed to his growing sense of competence and enabled him to navigate more effectively in his immediate organizational world:

> It is a hard thing to put your finger on, but it is reinforcing. He has given me an awful lot of confidence in myself that I lacked before. I had almost begun to feel that I was not really of much value.... Now I feel that I am being pushed, advised, growing. He has given me a lot of self-confidence that has made me much stronger and more valuable a person to the company.... I never enjoyed speaking before groups and that sort of thing before and now it doesn't bother me. I have a certain confidence that I feel that he has given me, because he forced me into a lot of situations of speaking before a group, before superiors...running a meeting...he has given me this self-confidence.

For a senior manager, this phase of the relationship produced substantial satisfaction in knowing that he had positively influenced a younger individual's development. The young manager received a promotion into middle management and recently left the department:

> I can tell you that the biggest satisfaction that I get is seeing someone that you have some faith in really go beyond where you expect and really seeing them get recognized for that.... To see them do an excellent job and see them get recognized for it is probably the most gratifying thing, like seeing your son graduate from college, like seeing your mother get a degree when she's 45 years old—it's that kind of pride that you take. You know you had faith in these people, you've helped them along, but you haven't told them what to do...it's like raising children...when you see those people get promoted and you're really pleased. And you say, "You know, I've had something to do with that."

Another senior manager describes his experience of the cultivation phase by noting how the young manager has grown to provide technical and psychological support. Thus he has benefited from the relationshp by enabling a younger individual to make his life at work easier and more enjoyable:

> He really has made it easier for me to do things that I think need doing, because I don't have to spend much time with him. With a less talented person, the other person would be taking another 5 to 10 percent of my time—so I'd be spending my time assisting that person in his operation, when I could be doing something else.
>
> So my work life is a lot more pleasurable. He is also enjoyable to watch and to think about.... I enjoy thinking about him and his career.... I think he will make a major contribution to the company.

Finally, a young female manager discovers the limitations of her developmental relationship two and a half years after it began. She found coaching, exposure-and-visibility, counseling, and friendship. However, she yearned for someone to model and to identify with in ways she could not with her mentor:

> I have yet to meet someone that I work for directly that I really want to emulate. That bothers me a lot. Jerry is close to it, but he does a lot of things that just aren't right for me.... He will get on my case, he will say I am a pussycat...but he just doesn't fully understand that women, just by being women, can't do exactly the same things that a man will do. It is almost like I need another woman, to be in that job, where I can see her style and really try it her way.

The combined effects of psychosocial and career functions are complex, and each individual is changed in some obvious and some subtle ways. The young manager generally becomes more self-confident and optimistic about the future; and, in identifying with the senior manager, parts of self are legitimized and brought to life through modeling and incorporation of new attitudes, values, and styles of operation. Through the relationship, the young manager not only acquires critical technical skills and learns the ropes of organizational life, but s/he also has the opportunity to experience confirmation and support for whom s/he is becoming.

The overriding benefit for the senior manager is empowerment. S/he experiences the capacity to support and to nurture and, in doing so, can note the extent to which s/he has influence in the organizational world. Not only is the senior manager able to open doors, but s/he also is able to transmit values and skills that enhance the young manager's capacities. These activities give rise to personal satisfaction and provide a unique avenue for expressing oneself through the next generation of managers.

During the cultivation phase the boundaries of the relationship have been clarified, and the uncertainty of what it might become during the initiation phase is no longer present. For some there is disappointment in discovering that the relationship cannot meet important developmental needs, as with the young female manager who wanted someone whom she could emulate more fully. For others, the relationship is far richer than anticipated, and the interpersonal bond is far more intimate and personally meaningful.

Separation

After a period of time ranging from two to five years, a mentor relationship moves into the third phase of separation. This phase is marked by significant changes in the functions provided by the relationship and in the affective experiences of both individuals. Some turmoil, anxiety, and feelings of loss generally characterize this period as the equilibrium of the cultivation phase is disrupted. It also is a time when the young manager experiences new independence and autonomy, and both managers reassess the value of the relationship as it becomes a less central part of each individual's life at work.

Separation occurs both structurally and psychologically. If a structural separation is timely, it stimulates an emotional separation that enables the young manager to test his or her ability to function effectively without close guidance and support. Alternatively, if a structural separation occurs prematurely, it stimulates a period of substantial anxiety as the young manager is forced to operate independently of his or her mentor before feeling ready to do so. Finally, if a structural separation occurs later than an emotional separation, either manager is likely to resent the other as the relationship becomes unresponsive to the individual's changing needs and concerns. In all instances, this phase is a period of adjustment because career and psychosocial functions can continue no longer in their previous form; the loss of some functions, and the modification of others, ultimately leads to a redefinition of the relationship.

Three years after a structural separation created by a promotion, a young manager describes the anxiety and turmoil of the first year apart from her mentor:

> I used to cry at home! What I did was much harder than ever, and the end of the first year, I said, "I made it! I must be O.K.!" The first year after I left was probably the hardest that I ever had in my life in terms of being emotionally trying. Proving myself, you know, having to prove myself more to me, than to others, as it turns out.

This young manager struggled with the temptation to return to her mentor for help. The structural separation urged her to complete an emotional separation as well. Over time she developed increasing self-confidence and a sense of autonomy:

> Part of the refusal to go back to him was that I really didn't want others to think that he was the reason I got my new job and that he was a crutch. I had to prove to myself and to everybody that it was me, that I could stand alone and that I no longer needed his support....
>
> My needs have changed now. In the growing up process, because I think I'm a lot more mature than I was.... I would hate to think that I am now like I used to be...but maybe he met the needs I had then and my needs are different now.... Things are different now—if I have a problem I don't think of going to him with it and maybe it's because I like to think of myself as self-reliant.

This young manager's mentor had a less stressful experience of the separation phase; as with other young managers in whom he had taken a strong interest, his dominant feelings were pride and satisfaction in seeing her move on. He missed having her around, but he accepted the separation in stride. He now continues to keep track of her performance, he continues to provide acceptance-and-confirmation and, to whatever extent possible, he will sponsor her in the future at a distance:

> I thought it was a good opportunity for her to have. I felt that she had a lot of potential, this was a promotion for her, and that she could best exercise her talent at the higher level....
>
> It is different though...after they leave you, you kind of keep up with them—and try to follow them along, and you take great pleasure in seeing them move along in the business. That's the fun of it all. It's amazing sometimes—the nicest thing is when you talk to a peer and find out she's doing really well....

There are other senior managers who anticipate such loss that they resist the separation by blocking promotional moves. Managers' comfort with their own positions seems to affect the extent to which they are willing to let their subordinates grow, separate, and move away or perhaps beyond them in organizational rank. For example, one senior manager, who recently learned that he would advance no further in the corporation, predicted no further movement for a young manager who is ready to move on:

> I don't think he will ever move out of this area even though he wants to. That's my candid opinion. I think he's at the level where if he were to move out of the group, he should have done it several years ago at a lower level. Lateral movement within a large corporation should occur at a lower level. The higher up someone goes, the more this movement slows down. I think he's right at that point now. He wants to be considered for a promotion out—I think he's locked in here.

Senior managers who shared this perspective on their young managers' potential for growth all had a dim view of their own opportunities for growth and advancement. It appears that organizational conditions that create blocked opportunity affect the extent to which a senior manager will encourage the separation phase to occur. When a senior manager sees limited opportunity for personal advancement, he is likely to resent and therefore delay a structural separation that enables a young manager to advance and grow.

When structural separation is imposed prematurely, the young manager feels abandoned and unprepared to meet new challenges. The loss of critical career and psychosocial functions can be traumatic. At the same time, organizational norms and practices mitigate against continued frequent contact. In one instance pressure was exerted to move a young manager to a new department. Both managers felt that the move was premature, and both felt that they had no choice but to accommodate the request. Two years later the young manager's performance had dropped considerably, and the senior manager was angry and disappointed. The young manager had become an extension of the senior manager, and thus her failure was his own:

> I cautioned against the move but my peers and my boss were extremely unsympathetic. They said it's where the business needs her and the needs of the business are more important than her feelings or my feelings....
>
> Now her poorer performance reflects on me. I was the person who got her promoted to the third level, and I was her earliest supporter.... So my judgment is reflected upon now—when you see one of your stars rising, and you promoted or evaluated that individual, or affected that person's career, it is very satisfying.... If they begin to go the other way, and you were a strong supporter, you feel disappointed and frustrated.

It is possible that the immediate trauma of the premature separation will subside, and that each someday will look back on this period with a new perspective. Whatever the long term consequences of this separation, the current experience is quite disruptive to both individuals.

The separation phase is critical to development. It provides an opportunity for the young manager to demonstrate essential job skills while operating independently without support from a mentor. At the same time, it enables the senior manager to demonstrate to self and to peers and superiors that, indeed, one has been successful in developing new managerial talent. The end of this phase occurs when both managers recognize that the relationship is no longer needed in its previous form.

Redefinition

The dominant pattern for the eight relationships that reached the redefinition phase is one in which the relationship becomes, primarily, a friendship. Both individuals continue to have some contact on an informal basis in order to continue the mutual support created in earlier years. Although there is less evidence of most career and psychosocial functions, sponsorship from a distance, occasional counselling and coaching, and ongoing friendship continue. The senior manager continues to be a supporter of the young manager and takes pride in the junior colleague's successive accomplishments. The young manager, operating independently of the senior manager, now enters the relationship on a more equal footing. With gratitude and appreciation for the guidance of earlier years, the young manager is now content to continue the relationship for the friendship it provides.

The senior manager, to some degree, is removed from a pedestal in the young manager's eyes, but s/he is still recalled with indebtedness. The excitement of the first two phases of the relationship is replaced with gratitude and realism about the contribution of the relationship to the young manager's learning and advancement. For the senior manager, the young manager is proof of effectiveness in passing on important values, knowledge, and skills; there is pride in seeing the young manager move on to greater responsibility and career advancement. Both individuals acknowledge that what was is no longer; they also recognize a new bond that is more responsive to their current needs:

> We can now talk about common problems, which I would have had some reservations talking to her about during the period when she was a subordinate. I guess I view it as I'm supportive of her and she's supportive of me—it's great—we have a mutual support system!

When two individuals have achieved peer status, there frequently is ambivalence and discomfort, as both adjust to the new role relationship. This may reflect the young manager's wish to continue to see the senior manager as all-knowing, or the senior manager's fear of being surpassed in some fundamental sense.

> Well to me he will always be the boss. Like I don't really see myself so much as his peer because he was the boss for so long. I will probably always look toward him for advice because I have a lot of respect for him.... We are peers now, but to me he will always have a part as the boss—even if I were to get promoted and he weren't.

One relationship that entered a redefinition phase is characterized by significant hostility and resentment. After several years of separation a young manager felt abandoned by her mentor and decided that the relationship was over. Although it is uncertain whether someday in the future the relationship might be renewed, at this point in time it has ended with bitterness. The young manager felt that her mentor was no longer taking an interest in her career, and at a social event she felt that he was inappropriately flirtatious towards her:

> Well there is quite a bit of distance there now, and quite a bit of fear on my part—and things have changed. Since before I always knew I had an ally in my old division—a friend who happened to be in a critical level of power. It was a very secure sort of feeling.... After a time, and after the social encounter I became quite fearful—I mean he might go around all of a sudden and change his mind about my competence, and no longer support me! I feel very uncomfortable now—I could never go back to work in his division....
>
> I don't known how healthy it is careerwise to let a relationship like that become so important. I think I was putting my eggs all in one basket, having one sponsor and being very dependent on that one sponsor.... I don't want to cultivate that kind of relationship again....

Perhaps the emotional intensity and expressed hostility provide a vehicle for completing psychological separation. As this young manager forms new relationships of a different kind and discovers that she can operate effectively without this relationship, her hostility may subside. It remains to be seen how a hostile termination of a developmental relationship affects both managers in later years.

The redefinition phase is, finally, evidence of changes that have occurred in both individuals. For the young manager, the ability to relate in a more peerlike fashion with the senior manager and the ability to function effectively in new settings without the immediate support of the relationship reflect greater competence, self-confidence, and autonomy. For the senior manager, the ability to relate in a more peerlike fashion with the young manager and the ability to redirect energies toward other young managers reflect competence and generativity. Both have experienced a shift in developmental tasks so that the previous relationship is no longer needed or desired.

Implications

This phase model illustrates how a mentor relationship moves through the phases of initiation, cultivation, separation, and redefinition (see Exhibit 2). Each phase is characterized by particular affective experiences, developmental functions, and interaction patterns that are shaped by individuals' needs and surrounding organizational circumstances.

This dynamic perspective delineates how a mentor relationship can enhance both individuals' development as it unfolds. When primary tasks are complementary, a mentor relationship is likely to reach the cultivation phase and to provide a range of career and psychosocial functions that enable the young adult to meet the challenges of initiation into the world of work, and the senior adult to meet the challenges of reappraisal at midlife. When, however, the young adult begins to feel established and more autonomous,

Exhibit 2
Phases of the Mentor Relationship

Phase	*Definition*	*Turning Points*[a]
Initiation	A period of six months to a year during which time the relationship gets started and begins to have importance for both managers.	Fantasies become concrete expectations. Expectations are met; senior manager provides coaching, challenging work, visibility; junior manager provides technical assistance, respect, and desire to be coached. There are opportunities for interaction around work tasks.
Cultivation	A period of two to five years during which time the range of career and psychosocial functions provided expand to a maximum.	Both individuals continue to benefit from the relationship. Opportunities for meaningful and more frequent interaction increase. Emotional bond deepens and intimacy increases.
Separation	A period of six months to two years after a significant change in the structural role relationship and/or in the emotional experience of the relationship.	Junior manager no longer wants guidance but rather the opportunity to work more autonomously. Senior manager faces midlife crisis and is less available to provide mentoring functions. Job rotation or promotion limits opportunities for continued interaction; career and psychosocial functions can no longer be provided. Blocked opportunity creates resentment and hostility that disrupts positive interaction.
Redefinition	An indefinite period after the separation phase, during which time the relationship is ended or takes on significantly different characteristics, making it a more peerlike friendship.	Stresses of separation diminish, and new relationships are formed. The mentor relationship is no longer needed in its previous form. Resentment and anger diminish; gratitude and appreciation increase. Peer status is achieved.

[a] Examples of the most frequently observed psychological and organizational factors that cause movement into the current relationship phase.

s/he no longer will look toward the senior adult for the same kind of guidance and support. If the senior adult has other avenues for creative expression of generative needs and can accept continued growth and advancement in the younger adult, then the relationship will follow its course through separation and redefinition.

Under certain conditions, a mentor relationship can become destructive for one or both individuals (Kram, 1980). For example, a young manager may feel undermined and held back by his or her mentor, or a senior mentor may feel threatened by his or her protégé's continued success and opportunity for advancement. Either is likely to occur when a senior adult enters a difficult midlife transition and/or a young adult encounters organizational barriers to advancement. Continued research in a variety of organizational contexts will further illuminate the factors that contribute to these dysfunctional dynamics as well as the range of organizational circumstances that facilitate movement through the phases of a mentor relationship in a manner that maximizes benefits to both individuals.

The research data from which the relationship phases were delineated indicated significant limitations in cross-sex relationships. The lack of an adequate role model in a male mentor caused young female managers to seek support and guidance from other female peers (Shapiro, Haseltine, & Rowe, 1978). Collusion in stereotypical behaviors encouraged women to maintain feelings of dependency and incompetence when they were attempting to become independent contributors (Kanter, 1977; Sheehy, 1976). Concerns about increasing intimacy and concerns about the public image of the relationship caused both individuals to avoid interaction that had the potential to provide a wide range of career and psychosocial functions. Similar complexities are likely to exist in cross-race relationships. There is a need to study further the unique attributes of cross-sex and cross-race relationships to determine whether observed relationship limitations can be alleviated.

Given that such developmental relationships are limited in value and time duration as a result of changing individual needs and organizational circumstances, it is likely that an individual will have, over the course of an organizational career, several developmental relationships that provide a range of critical career and psychosocial functions at each life/career stage. The wish to find one senior manager who will carry an individual through his or her career, and who will continue to be responsive to individual concerns, is one that is likely to generate considerable disappointment and disillusionment.

It would be fruitful, therefore, to investigate the patterns of relationships that individuals have at successive career stages in order to illuminate other developmental relationships as alternatives to the primary mentor relationship. Not only is the mentor relationship limited in value and duration, but it may not be readily available to all individuals in the early stage of a career because of organizational conditions and/or limited individual capacities to form enhancing relationships. Peer relationships appear to offer a valuable alternative to the mentor relationship; they can provide some career and psychosocial functions, they offer the opportunity for greater mutuality and sense of equality, and they are more available in numbers. Future research efforts designed to clarify the role of peer relationships in early and midcareers would offer insight into the range of developmental relationships that are possible at each career stage.

Because relationships are shaped by both individual needs and organizational circumstances, interventions designed to enhance relationship-building skills and to create organizational conditions that foster developmental relationships in a work setting should be explored. In preparation for this applied work, however, it is necessary to delineate further the characteristics of individuals who seek out and benefit from relationships with mentors, as well as the characteristics of organizations that facilitate or hinder initiation and cultivation of enhancing relationships. It is essential that next steps in research be conducted in a variety of settings so that the relevant organizational factors can be identified.

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The Effects of Departmental Demography on Turnover: The Case of a University

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The argument developed here is that turnover or exit behavior is, in part, a characteristic of the demography of the social system itself. University academic departments with a dominant cohort and those with substantial gaps among cohorts were found to be characterized by increased rates of voluntary retirements, resignations, and expired appointments.

Over a decade ago, McNeil and Thompson (1971) noted that regeneration processes and, particularly, the ratio of newer to older members could have substantial consequences for organizational outcomes, including communication, socialization, innovation, and the size of the administrative component. At about the same time, Stinchcombe, McDill, and Walker (1968) argued that the variables of demographic theory could be applied to organizations as well as to communities. They suggested that demographic processes might be important theoretically in the study of formal organizations. The notion that what occurs within an organization may be, in part, a function of its social composition or demography is consistent with a large body of literature that has documented the impact of demography on norms and political attitudes (Cutler, 1977; Glenn, 1969), political governance structures (Kessel, 1962; Schnore & Alford, 1963), crime rates (Shelley, 1980), and social change (Rogers & Shoemaker, 1977). Unfortunately, the impact of demography on formal organizations thus far has received little attention either theoretically or empirically, although Stewman (1975) has examined some demographic effects on mobility processes within public bureaucracies.

Pfeffer (1983) has suggested that cohort effects are important manifestations of the effects of length of service distributions in organizations. The existence of clearly defined demographic cohorts, that is, individuals who entered the organization during approximately the same time interval, may have two significant impacts. First, the existence of well-defined cohorts may lead to conflict among groups over issues such as resource allocation and control. Ryder has noted that "a prominent theme in discussions of modern society is intergenerational conflict" (1965, p. 853). And Gusfield has argued, "Conflicts of power and policy between age-groups are a common feature of many organizational structures" (1957, p. 232). Second, within cohorts there exists the opportunity for the development of group solidarity and sponsorship in the contest for resources and control. Thus, the existence of groups of individuals who identify with each other and who perceive themselves to be distinct from other organizational members may affect the way individuals interact and perform within organizations (Kanter, 1977; Roberts & O'Reilly, 1979; Wells & Pelz, 1966).

The purpose of the present study is to investigate the relationships among the demography of academic departments and the exit of members through voluntary resignations, early retirement, or, in the case of assistant professors, involuntary termination. The argument to be developed suggests that departments with substantial gaps between one cohort and another will be more likely to experience increased turnover. Because turnover may result from causes other than the length of service distribution of the department, the effects of cleavages among cohorts are examined after controlling for department size, budgetary slack, and the level of paradigm development, a measure of consensus as operationalized and used by several researchers (Lodahl & Gordon, 1972; Pfeffer & Moore, 1980; Salancik, Staw, & Pondy, 1980).

Background and Hypotheses

The previous literature on turnover has focused virtually exclusively on turnover as an individual variable predicted by individual-level factors (Muchinsky & Tuttle, 1979; Porter & Steers, 1973) such as job satisfaction (for example, Mobley, Horner, & Hollingsworth, 1978); commitment (O'Reilly & Caldwell, 1980, 1981; Steers, 1977); individual characteristics such as age, organizational tenure, and race (Mobley et al., 1978); and intention to quit (Mobley, Griffeth, Hand, & Meglino, 1979). The argument developed here is that turnover or exit behavior also may be a characteristic of the system in which it occurs and, as such, may reflect something about the conditions of that system (Hirschman, 1970; Price, 1977). This argument has been made directly in studying turnover of high level managers or administrators (Allen, Panian, & Lotz, 1979; McEachern, 1975; Pfeffer & Moore, 1980; Pfeffer & Salancik, 1977; Salancik & Pfeffer, 1980), in which organizational characteristics such as size or performance are used to explain executive succession rates as properties of organizational systems.

A similar level of analysis can be used to explore turnover rates for other organizational members as well.

It is suggested that a critical demographic variable impacting turnover is the extent to which there are definable cleavages or discontinuities in the organizational unit's membership that may make communication more difficult and conflict and power struggles more likely to occur, and more severe when they do occur. These differences among cohorts can have several effects that can positively impact turnover. In the first place, most individuals experience power struggles and conflict as aversive (Janis & Mann, 1977; Thomas, 1976), and thus the presence of such activities occurring among cohorts in the department diminishes the department's attractiveness as a place to work. This, presumably, would increase the likelihood of voluntary turnover. Second, power struggles among cohorts in a department may cause those who lose out to exercise their option of exit (Hirschman, 1970). Thus, an older cohort that loses power to relatively new entrants in the department is likely to respond by resignations or early retirements. The likelihood of recruiting new departmental members from that older cohort's generation are remote, and new entrants naturally will tend to be more closely aligned with the younger, now more powerful, group. Furthermore, members not in the cohort, or those who are in cohorts that are in a weaker position in the unit, may not be well socialized or well integrated into the department. This lack of integration and socialization can weaken the attachment of the individual and increase the likelihood of leaving (Roberts & O'Reilly, 1979).

Gusfield's (1957) study of the Women's Christian Temperance Union (WCTU) is both one of the few and also a classic study of cohorts and their effects on conflict and turnover in an organization. After the repeal of prohibition (the Eighteenth Amendment), two groups were apparent in the WCTU. The older, "conviction-oriented" group wanted to continue "the tactics and goals of the prohibition period" (Gusfield, 1957, p. 324). The "public-oriented" group, comprised primarily of newer and younger members, who wanted to "substitute the primacy of educational and persuasional aims for those of less respectable legal and political measures to restrict the sale of liquor" (Gusfield, 1957, p. 324). The older members were able to institutionalize and retain control through a variety of mechanisms. The WCTU failed to adjust its aims, tactics, or ideology to the changing social environment, and as a consequence it experienced a substantial decline in membership; the younger members left and recruiting of new members became more difficult.

Ryder (1965) has also emphasized the critical role of intergenerational conflict in the production of social change. Each cohort entering a social system is imprinted, to some extent, by the major events and conditions that occurred at a formative stage of development. In an example of the use of these ideas to understand the choice of theoretical premises and topic, Cartwright (1979) has argued that social psychology can be understood in terms of the cohorts of researchers active in and controlling the field.

Early concern with topics such as democratic versus authoritarian leadership and participation (Lewin, Lippitt, & White, 1956) reflected the influence on the field of scholars who had fled from Nazi Germany as well as the influence of the Cold War. Concern with attitudes and attitude change then followed, as racial integration became an important focus of societal concern in the 1950s. The effect of the Vietnam War period on social science research can be seen in the attention to topics such as escalating commitment (Staw, 1976) and in the use of ROTC and the draft lottery as treatments in quasi-treatments (Staw, 1974).

To the extent that cohorts become associated with ideologies or technologies prevalent at the time of their entry into the organization, it can be argued that organizational change is a process very much affected by the organization's demographic structure and the resulting ease or difficulty of cohort succession. Studying the American Foreign Service, Reed noted: "To the extent that organizational adaptation requires changes in composition of personnel skills and attitudes, cohort organization will contribute to a lag in organizational responsiveness" (Reed, 1978, p. 404). Downs (1967) concluded that the responsiveness of federal bureaucracies was affected by the age and seniority distribution of employees, and Lipset (1959), studying Saskatchewan bureaucrats, noted that political change was retarded by the presence of senior cohorts. Thus, one important explanation for organizational inertia may be the particular cohort structure and its seniority. As Reed concluded:

> Pressures for regeneration are frequently associated with newer cohorts acting as the bearers of technological innovations and new values. The responsiveness of organizations is contingent on the relative size and structure of cohorts and their impact on mobility into positions of organizational control. . . resistance to change is associated frequently with older cohorts whose skills and interests may become obsolete in a changing world. . . organizational demography will contribute much to any analysis of organizational change (1978, p. 409).

It has been argued here that cohorts, defined by age or time of entry into the social system, are consequential social realities. Furthermore, the existing literature strongly supports the idea that conflict across such generational cohorts is potentially likely and an important organizational process. Finally, the present authors have suggested that such conflict makes the organizational unit less pleasant and that losers in such conflicts may either leave voluntarily or be forced out, suggesting that the extent to which there are important cleavages and divisions across cohorts in a department should positively predict the amount of turnover experienced in that subunit. What remains is to indicate more precisely what kinds of indicators of such cohort effects are reasonable.

Cohorts and Turnover

There are two dimensions of the demography of an organizational unit that might affect the attachment of members to the department as well as the extent to which intergenerational conflict will occur and be severe. The first is the proportion of the unit with a given tenure. The larger the proportion of members with the same or approximately similar tenure, the greater the opportunity for similarity of outlook as well as interpersonal attraction to develop within that group, and the more distinct that cluster will be from others in the unit. Ryder (1965), for instance, has suggested that members who enter the organization at the same time are more likely to have experienced similar events and to see themselves as similar. Pfeffer (1983) has speculated that this effect may be common in university departments, with older faculty who were hired prior to 1957 and the period of rapid expansion having lower financial expectations and less commitment to research than those hired during the period of increasing real incomes and rapidly expanding research programs. Thus, if a department were dominated by an older cohort, one might expect that younger members would be less integrated and less influential and would be more likely to exit both voluntarily and involuntarily. Conversely, if because of the hiring patterns there existed a younger dominant cohort, one would expect to see a higher incidence of voluntary exit among the older faculty. The critical factor is the extent to which there exists a dominant cohort, identified by having a large proportion of the present organizational membership having entered in a relatively short span of time. Therefore, the first hypothesis is:

Hypothesis 1: Turnover will be higher in departments in which comparatively a large proportion of the faculty entered the unit at the same time.

A second source of intergenerational cohort conflict may result from the size of the gaps between cohorts. If an organization hires on a regular basis, the processes of integration and succession are likely to proceed in an orderly manner, with new members able to interact with senior members who are only slightly less similar to them; and through these persons new members are able to link with even more senior members of the unit. Socialization into the organization and the development of a more uniform organizational culture is fostered with the existence of linking cohorts (Ouchi & Jaeger, 1978). However, when there are large gaps between cohorts as, for instance, a six or seven year period before a new wave of hiring, it is likely that perceptions, values, and beliefs will differ more and the opportunity for communication failures to occur will increase. The existence of well-differentiated cohorts increases the possibility of the development of different group norms and expectations and the likelihood for observing intragroup solidarity within the cohorts and intergroup conflict among them. This suggests:

Hypothesis 2: Turnover will be higher in departments in which there are large gaps between cohorts.

Additional Predictors of Turnover

Although the general argument posits an association between departmental demography and turnover, there are other factors that might explain departmental turnover and need to be controlled statistically. The size of the department is one such variable. In investigating the number of exits, it is obviously the case that a department of 40 persons has more potential for exit than one of 10 persons, ceteris paribus. Turnover is higher, in other words, simply because there may be more persons who can exit. In addition to this simple probability effect, size also may affect the extent to which turnover is disruptive to the organizational unit (Grusky, 1961). Following Grusky's reasoning, if larger size makes turnover less disruptive, less attention might be paid to preventing voluntary turnover, and more involuntary turnover at the assistant professor rank might be tolerated. It does seem plausible to presume that issues such as rearranging teaching and advising responsibilities and distributing the other work of the department is less problematic in larger rather than smaller units.

In addition to size, the relative scarcity or the munificence of resources is an important variable that also might affect conflict and turnover. Katz and Kahn (1978) have argued that growth and greater resource availability reduce conflict. Studies of university decision making (Hills & Mahoney, 1978; Salancik & Pfeffer, 1974) have found that greater resource scarcity is associated with more use of power and politics in decision making. Thus, more resources provide more slack (Cyert & March, 1963), ameliorating conflict and therefore decreasing the likelihood of political struggles and turnover. Of course, greater resources also make the department a more pleasant place to be for other reasons as well, such as the availability of research support and so forth, which also should act to decrease turnover.

A third variable that might affect turnover is the level of development of the department's scientific paradigm. With respect to department head turnover, the argument has been made (Pfeffer & Moore, 1980; Salancik et al., 1980) that the level of paradigm development is associated with the ease of reaching consensus over critical decisions and, conversely, is negatively related to the level of decisional conflict experienced in the department. Indeed, in the two studies cited, the level of paradigm development was the single best predictor of department head tenure. The existence of consensus, facilitated by a higher level of paradigm development, can have several effects that might act to reduce turnover. First, the reduction in the level of conflict, as noted previously, can make the department a more pleasant place to work. Second, the reduction of conflict and the associated political struggles make the elimination of opponents through denial of tenure or through exerting pressures for voluntary resignations or early retirement a less likely event. Third, a common paradigm may facilitate communication and the development of shared understandings across different cohorts. This consensus can improve the ability of members to communicate with each other. In turn, this increased communication and shared culture serve to integrate the members more closely into the department, making turnover less likely to occur.

It is clear that, as explanations for the amount of turnover experienced in a department, these variables are as much complementary to as competing with the cohort effects. Nevertheless, they need to be included to ensure that the effect of the cohort measures observed are not capturing some other omitted effects as well.

Method

Sample

From 2 campuses of a large state university, 32 departments were analyzed. The 16 discipline groups these departments represent are listed in Exhibit 1. The sample represents all but eight departments included in the Pfeffer and Moore (1980) study of department head tenure. The omitted departments were ones for which turnover data could not be obtained. Data for the study covered the years 1974-1975 through 1978-1979 and were obtained from the university academic planning and personnel offices.

Exhibit 1
Departments in Study
(Same Departments Were Used on Both Campuses)

Anthropology
Art
Chemistry
Economics
English
French
Geology
German
History
Mathematics
Philosophy
Physics
Political Science
Psychology
Sociology
Spanish

Demographic Distribution

All measures for the demographic distribution of departments pertain to the distribution existing in the 1974-1975 academic year. The date individuals first entered the university as full-time faculty constituted the basis for defining cohorts. Names of faculty members were checked against two or three independent archival sources to ensure an accurate reconstruction of the distribution of faculty by date of entry within the departments.

Two measures of the demographic distribution of the departments, corresponding to those introduced in the hypotheses, were defined. One is the size and number of gaps between cohorts. These gaps represent periods in which no new individuals in the department in 1974-1975 had been hired. The number of years between entry dates for adjacent hires was calculated, and then a distribution of such gaps was produced for each department. The independent measure used in the statistical analyses was the number of five to eight year long gaps among entrants in each department. This variable, then, measures the number of relatively long time periods between groups of hires in a department. Because tenure typically is granted after six or seven years, it was felt that five to eight years was indeed a consequential period between hires. Furthermore, five or more years seemed to be a period beyond which association among individuals would be hindered.

The other demographic variable was the relative size of a predefined cohort group. The range of years faculty had entered the department was divided into 10-year spans. The first span represented individuals who had joined the department in the 1935-1944 period, the second from 1945 to 1954, and so on. The proportion of the department represented by faculty in the 1935-1944 period was the second demographic variable. This variable indexes both the clustering of the department and, more importantly, the extent to which the older, and presumably more powerful, members dominated the department on a numerical basis. The measure indexes the lumpiness of the department's distribution, as well as the extent to which the department was dominated by an older cohort.

Size

The size of the department was measured by the number of faculty who served in one of the regular ranks (assistant, associate, or full professor) in 1975. Because the issues involve interpersonal conflict, communication, and socialization, it was thought that personnel size was the appropriate measure of subunit size (Kimberly, 1976).

Slack Resources

Slack resources was defined by dividing the total budget of the department by the number of regular faculty. The use of total budget produces a number that is very highly correlated with faculty size, because faculty salaries comprise some 80 percent of the budget. Moreover, budget measures the munificence or scarcity of resources only as such budget is compared to the number of persons who must be supported. Clearly, this is not a perfect indicator of resource scarcity. One might, for instance, want to consider resources in comparison to the number of students to be taught (Pfeffer & Salancik, 1974). Experimentation with some other indicators of resource scarcity did not produce results different from those to be reported; thus, this indicator of resource availability is the one used.

Level of Paradigm Development

Following Lodahl and Gordon (1972), the level of development of the department's scientific paradigm is conceptualized as the amount of technical uncertainty about what research to conduct and how to conduct it. Pfeffer and Moore (1980) and Salancik et al. (1980) argued that uncertainty should have at least two manifestations in academic disciplines: (1) more uncertain fields should require more words to communicate their research results, with a consequent increase in the length of both doctoral dissertations (in pages) and dissertation abstracts (in words); (2) in more uncertain fields, it should be more difficult to construct sequentially interdependent training activities or sequences of courses. Thus, the length of the longest course chain (with one course being prerequisite to another) should be shorter in paradigmatically less-developed fields. Both indicators (communication parsimony and integration of the curriculum) index the extent to which there are shared definitions of the academic discipline.

Because the scientific fields examined are the same as those used in these previous studies, the measures of paradigm development from Pfeffer and Moore (1980) were employed. As reported in that study, there was excellent convergence among the indicators of paradigm development, and the three measures were all very highly correlated with an overall index constructed from a composite of standardized scores of the individual indicators.

Turnover

The dependent variable was the amount of turnover experienced by the department. Turnover figures were gathered for the five years 1974-1975 through 1978-1979 from the university personnel office and were summed to produce a measure of the amount of turnover experienced by each department. Turnover was measured in the following categories. Voluntary resignations by persons at each rank (assistant, associate, and full professor) were analyzed separately. In addition, for full professors, the number of early retirements was assessed. Finally, for assistant professors, the amount of involuntary turnover was measured by noting the number of such professors who left at the time of their final review or after a terminal year. Assistant professors leaving before that review were considered to have left voluntarily. Of course, an assistant professor may leave in his or her third or fourth year because of counseling indicating that prospects for eventual tenure are poor. There is no way to distinguish such turnover from other voluntary turnover. Moreover, there is no reason to assume that such turnover would not be reasonably randomly distributed across departments; thus, this misclassification would merely introduce some additional measurement error. In addition to these separate turnover categories by rank, the total amount of turnover experienced by the department across all ranks and across all reasons was determined by summing the individual categories. This measure also was used as a dependent variable in the analysis. Note that deaths and regular retirements because the person reached mandatory retirement age were excluded from the turnover measures.

Results

Means and standard deviations for each of the variables are presented in Table 1. Early retirements, on average, are equal to resignations in terms of how full professors leave the system voluntarily. The correlation matrix for the complete set of variables is displayed in Table 2. As would be expected, the various turnover measures are correlated with total turnover, but for the most part they are not highly correlated with each other. There is a correlation between budget per faculty and the level of paradigm

Table 1
Means and Standard Deviations of Variables
($N = 32$)

Variable	Mean	Standard Deviation
Total resignations	1.50	1.70
Full professor resignations	.47	.92
Associate professor resignations	.22	.42
Assistant professor resignations	.38	.71
Early retirements	.44	.67
Assistant professor expired appointments	1.19	2.08
Department size	29.34	16.11
Index of level of paradigm development	25.59	14.27
Budget per faculty	48980.06	62342.11
Relative size of 1935-1944 faculty cohort	.21	.31
Sum of the five, six, seven, and eight years gaps in faculty entry dates	.97	.65

development. For purposes of analysis, the next highest correlation between two independent variables is $r = 35$.

In Table 3, regression results for each of the six dependent variables are presented. Four regressions per dependent variable are displayed. In the first regression, only the three control variables—size, budget per faculty, and the level of paradigm development—are included. In the next two regressions, each of the two demographic distribution variables is included separately along with the control variables. In the final regression, all five variables are included at once. This analysis permits one to assess the unique contribution of the demographic variables to the amount of explained variance. Although not shown in Table 3, all regressions were run with campus as a dummy variable. In no instance were there significant differences in results attributable to campus differences.

With the exception of size, the control variables are largely uncorrelated with any of the turnover measures. Size is significantly associated with resignations of full professors, with expired appointments of assistant professors (involuntary turnover), and to some extent with total faculty resignations. In all these instances, size enters with the expected positive sign, meaning the larger the faculty, the more the resignations. Size is not associated, however, with early retirements or with the voluntary resignations of associate or assistant professors.

The level of paradigm development would be expected to be negatively related to turnover. Although the paradigm measure enters the equations most frequently with the expected negative sign, it is only in the case of involuntary turnover at the assistant professor rank that the variable is statistically significant. Although one should be cautious in drawing generalizations from turnover studied essentially in a single organization, these results seem to suggest that the impact of the greater certainty and consensus associated with higher levels of paradigm development is primarily on the promotion of assistant professors rather than on voluntary quitting by persons at other ranks. The greater level of the 1935-1944 cohort also

Table 2
Correlations among Variables
($N = 32$ Departments)

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. Total resignations (1975-1979)	—										
2. Full professor resignations	.73**	—									
3. Full professor early retirements	.51**	.02	—								
4. Associate professor resignations	.47**	.14	.22	—							
5. Assistant professor resignations	.70**	.37*	.12	.15	—						
6. Assistant professor terminations	.34**	.63**	-.08	.10	.04	—					
7. Department size	.30*	.43**	.05	.03	.10	.43**	—				
8. Department's proportional budget (Total budget/depart size)	.11	-.01	.07	-.22	.34*	-.14	.27	—			
9. Index of paradigm development	.04	.03	.01	-.12	.14	.16	.30*	.54**	—		
10. Proportion of faculty in 1935-1944 cohort	.62**	.33*	.42**	.26	.51**	.10	.21	.32*	.19	—	
11. Number of 5-8 year gaps in departmental faculty	.37*	.30*	.26	.03	.24	.20	-.27	-.24	-.02	.35**	—

*$p < .05$

**$p < .01$

Table 3
Regression Equations Predicting Faculty Turnover for 1975-1979

Variables	R^2	*Size*	*Budget*	*Paradigm*	*Cohort Size*	*Cohort Gaps*
1. Total faculty resignations	.09	.30	.06	-.08		
	.43***	.22	-.11	-.07	.61**	—
	.34**	.44**	.22	-.19		.53**
	.48***	.32*	.01	-.13	.46**	.29*
2. Full professor resignations	.20*	.47**	-.11	-.05		
	.29**	.43**	-.20	-.05	.31*	
	.38***	.59***	.01	-.15		.46***
	.39***	.56***	-.03	.13	.09	.40***
3. Full professor early retirements	.00	.04	.08	-.05		
	.18	-.01	-.04	-.04	.44**	
	.10	.13	.18	-.12		.33*
	.19	.02	.01	-.07	.37*	.13
4. Associate professor resignations	.05	.10	-.23	-.02		
	.16	.05	-.33	-.01	.35*	
	.05	.09	-.23	-.02		-.00
	.21	-.03	-.44*	.03	.49**	-.26
5. Assistant professor resignations	.11	.02	.36	.06		
	.29**	-.03	.23	-.05	.44**	
	.24	.12	.47**	-.14		.38**
	.32*	.02	.32	-.10	.34	.20
6. Assistant professor terminations	.32**	.57***	-.16	-.24		
	.32**	.55***	-.18	-.24	.08	
	.42***	.66***	-.06	-.31*		.35*
	.44**	.70***	-.00	-.33*	-.13	.42**

*$p<.10$
**$p<.05$
***$p<.01$

is statistically significant in all the turnover types except the number of assistant professor expired appointments. The two variables together are sometimes both significant, and sometimes not. It would be possible to trim the regression equations by eliminating the insignificant control variables, for instance, and find that for all of the dependent variables, a significant regression equation emerges and in all instances one term in that equation represents the demographic distribution of the department.

The amount of variation explained, and particularly the amount of incremental variation explained by the demographic variables, indicates that organizational demography is substantively as well as statistically significant. In four of the six full equations, more than 30 percent of the variation is accounted for, and only in the case of expired appointments and full professor resignations do the control variables account for more of the variation than the demographic measures. Thus, it seems fair to conclude that turnover, both voluntary and involuntary, at virtually all ranks can be accounted for in this context at least partly by considerations of the length of service distribution of the departmental members. Organizational demography and the cohort effects associated with that demography are, indeed, important variables impacting organizational processes.

Discussion

The entry of new members into an organization and particularly the distribution of times of entry are important for understanding a number of organizational processes and outcomes. People who enter together or at approximately the same time are more likely to associate with each other and to have a similar perspective on the organization and its operations. It is for this reason that cohorts are consequential for understanding political processes in organizations and for understanding patterns of conflict and integration that develop. Conflict across cohorts is an important process. It produces change and adaptive organizations, and it has an effect on the retention of various types of organizational members.

In the present study, the turnover of academic personnel both voluntary and involuntary was found to be associated with the extent to which there were identifiable discontinuities or bulges in the organizational units' demographic distributions. Gaps of several years in the starting dates of the faculty in place and a large proportion of faculty from an early decade in the organization were both correlated with turnover indicators, including early retirements; voluntary resignations, particularly at the full professor and assistant professor ranks; and involuntary turnover resulting from the expiration of appointments at the assistant professor level.

In addition, this study demonstrates that turnover can be productively examined as an attribute of an organizational system or subsystem and investigated as an individual behavior that is the consequence of individual characteristics and decision processes. In examining turnover, variables that index the extent to which there is conflict or cleavage within the unit, or alternatively, the extent to which there is socialization and integration clearly are important candidates for inclusion. Demographic indicators are variables of this type.

Finally, it is important to note that a substantial proportion of the variation in many of the turnover variables was explained by these relatively simple demographic indicators. This indicates the substantive importance of including demographic considerations in organizational analysis. For these reasons, the typical call for further research is of more than routine necessity in this particular instance. The measurement of organizational demography itself poses some thorny conceptual and empirical issues (Pfeffer, 1983). In the present instance, the measures assessing the extent to which there were likely to be cleavages among cohorts in the subunits were largely intuitively derived. It simply made sense to believe that integration and cohesion would be diminished to the extent that there were large gaps between dates of hire and bulges of people in different cohorts in the departments. Clearly, other indicators of cohort differentiation are possible to develop. In further studies using demography as an explanatory variable, such metric development will be an important task.

The present study investigated one aspect of organizational demography, the effect of distinct cohorts on one dependent variable—the level of turnover experienced by the departments. There are other important compositional indicators of organizational demography, such as the regeneration index (McNeil & Thompson, 1971), and other important organizational outcomes, such as the size of the administrative component, the form of control employed, and the extent to which innovation and adaptation occur (Staw, 1980). Extensions in both the type of demographic indicators considered and the dependent variables examined would seem to be warranted.

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Improving the Performance of Low Self-Esteem Individuals: An Attributional Approach[1]

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Low self-esteem individuals, who blame themselves for their failures, perpetuate continued failure and negative self-evaluation. The present study suggests that this "vicious cycle" of low self-esteem can be broken if low self-esteem persons attribute their failure at an insoluble task to the difficulty of the task, rather than to their own personal inadequacies.

Organizational behaviorists have been interested in delineating the antecedents of work behaviors and attitudes such as vocational choice, job satisfaction, and employee motivation and performance (Brayfield & Crockett, 1955; Vroom, 1964). The underlying motivations of the researchers have ranged from the practical (e.g., to help managers understand the factors affecting their employees' morale and productivity) to the theoretical (e.g., Korman's, 1970, ambitious attempt to explain why certain situational and dispositional variables influence a myriad of work behaviors).

Research has shown repeatedly that a particularly important personality variable is the individual's self-esteem. For example, it has been found that: (1) low self-esteem people (low SEs) are less apt to choose jobs that suit their needs and abilities than are high self-esteem employees (high SEs) (Korman, 1966, 1967); (2) low SEs do not regularly exhibit the intuitively expected positive correlation between work performance and satisfaction, whereas high SEs do (Greenhaus & Badin, 1974; Inkson, 1978; Korman, 1968); and (3) low SEs often perform more poorly than do high SEs (Korman, 1970; Shrauger, 1972). Taken together, the many empirical findings suggest that low SEs behave less than optimally—by not choosing occupations for which they are best suited, by not performing as capably as they might, and by not deriving satisfaction from their performance in those

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instances in which they do function well. Stated differently, low SEs exhibit behavioral/psychological tendencies that are quite likely to reinforce their low self-esteem. For example, the likely effect of the low SEs' frequently poor performance (or perception of having performed poorly) is continued negative self-appraisal.

There is considerable theoretical controversy concerning the reasons for low (and high) SEs to respond in fashions consistent with their existing self-image (Dipboye, 1977a, 1977b; Korman, 1970, 1977). The purpose of this paper is *not* to contrast the relative merits of their theories. Rather, the goal is to call attention to the following question of considerable practical and theoretical significance: Can low SEs be led to respond in a fashion that will not perpetuate their low self-esteem? That is, can their self-defeating, "vicious cycle" patterns of behavior be minimized if not eliminated? More specifically, is it possible to enhance the task performance of low SEs? If low SEs can perform more effectively, then ultimately they may come to evaluate themselves more favorably. Moreover, as their self-esteem improves, they should begin to show a different brand of self-perpetuating behavior—that which reinforces their high, rather than low, self-esteem.

Recent findings in the experimental personality literature have suggested that low SEs usually do not lack the ability to perform as well as high SEs. Rather, a variety of cognitive processes in evaluative achievement situations appears to mediate the deflated performance of low SEs. For example, compared to high SEs, low SEs often set lower expectations for their performance (Coopersmith, 1967; Shrauger, 1972), which may well lead to reduced effort (Sigall & Gould, 1977) and performance. In addition, it has been shown that self-directed attention inhibits the performance of low SEs. Most evaluative test situations have the potential to make the performer feel self-conscious. Prior research has demonstrated that stimuli that produce self-focused attention (e.g., a mirror, an observing audience, or a video camera) have a markedly detrimental effect on the task performance of low SEs. By contrast, the performance of high SEs is not affected by these same factors (Brockner, 1979a; Brockner & Hulton, 1978; Shrauger, 1972).

The causal attributions that low SEs make for their outcomes also can affect their subsequent performance (and, by extension, their self-esteem). When individuals succeed at some task, their self-esteem may be (at least temporarily) enhanced. However, low SEs tend psychologically to minimize their success experiences by attributing them to external factors—e.g., "the task was easy" or "I got lucky" (Diener & Dweck, 1980; Gergen & Marecek, 1976). Failure outcomes, on the other had, have the potential to produce a (temporary) loss of self-esteem. To make matters worse, low SEs tend to attribute their failures to internal causes (Fitch, 1970; Kuiper, 1978). In Bandurian terms (Bandura, 1977), the low SEs' psychological response to failure probably lowers their sense of self-efficacy ("I knew that I didn't have what it takes to do well at this task"). Lowered self-efficacy, in turn, should have an inhibitory effect on their performance at a later task (Brief & Aldag, 1981).

This attributional analysis implies that the performance of low SEs could be improved if they changed their customary attributions for success and failure. If, for example, low SEs could attribute a prior success to internal causes, their subsequent performance (and perhaps self-esteem) should be enhanced. In fact, a recent study by Miller and Norman (1981) demonstrated that low SEs' subsequent performance and mood were elevated to the extent that they attributed their previous success to an internal (i.e., their intellectual ability) rather than an external cause (i.e., the ease of the task).

The present study was designed to test the notion that the task performance of low SEs could be improved if they attributed their prior *failure* to an external rather than an internal cause. Presumably, low SEs' self-efficacy should be much less threatened by a failure that was not diagnostic of the self. Stated differently, low SEs should then approach the next task with reduced feelings of anxiety and/or self-consciousness. Decreased anxiety/self-consciousness, moreover, has been shown to enhance the performance of low SEs. The performance of high SEs, by comparison, has not been further heightened by manipulations designed to reduce anxiety or self-consciousness, probably because high SEs are already low on these dimensions (Brockner, 1979a; Brockner, 1979b).

Subjects in this study were first classified as low or high in self-esteem on the basis of their responses to standardized personality inventories. They next were assigned to one of four conditions. In three of these conditions subjects experienced failure by working on a task that was insoluble (unbeknownst to them, of course). One group was led to attribute their failure to the difficulty of the task (external condition); one group was led to attribute their failure to themselves (internal condition); and a third group was not induced to make any specific causal attribution for their failure (no attribution condition). A fourth set of subjects completed the self-esteem questionnaires but did not perform the insoluble task (control condition). All participants then had to perform a soluble anagrams task. The primary dependent variables were the number of anagrams solved and the time taken to solve them. An interaction between self-esteem and attribution was predicted: low SEs should perform better in the external than in all other conditions, whereas high SEs should perform well in all conditions and be uninfluenced by the attribution variable. The *within-condition* relationships between self-esteem and performance were less easily predictable. Tentatively, given that high SEs often (but not always) outperform low SEs (Miller & Seligman, 1975; Shrauger, 1972), it was expected that high SEs would solve more anagrams than low SEs in the control, internal, and no attribution conditions. In the external condition, however, the performance of low SEs should be only slightly less than, or perhaps even equal to, the level exhibited by high SEs.

Method

Participants

A total of 168 (97 female and 71 male) introductory psychology students at SUNY College at Brockport received course credit for completing the study.

Procedure

All subjects were tested individually. On entering the laboratory for a "problem-solving" experiment, subjects were ushered into a research cubicle and told that they would be "participating in two different experiments today." In the first part, subjects completed two different measures of self-esteem: the revised Janis-Field self-esteem scale (Eagly, 1967), and the Beck depression inventory (Beck, 1967). Although both scales require individuals to make self-evaluative judgments, their content varies considerably. The former taps social competence and global self-evaluation, and the latter measures mood state, guilt, and perceived favorability of future events. Nevertheless, subjects' scores on these two scales were substantially related, $r(166) = -.45$, $p < .001$.

The (inverse) relationship between depression and self-esteem has been explored at both the conceptual and empirical levels. Clinical theories of depression (Beck, 1967) suggest that negative self-evaluation or low self-esteem is a central component of depressive symptoms. Moreover, as in the present study, personality measures of depression and self-esteem are negatively correlated (Inkson, 1978). Although self-esteem and depression are negatively related, they are not isomorphic. Some of the most important symptoms of depression (e.g., reduced initiation of response) are not self-evaluative. Two different operationalizations of self-esteem were employed for convergent validity reasons. That is, if self-esteem is the conceptual independent variable underlying the findings, then there should be similar results, regardless of whether self-esteem is operationalized through the depression or self-esteem scales. To avoid confusion, Self-esteem will be capitalized only when referred to as an operational variable (i.e., the Janis-Field scale used to measure self-esteem). When self-esteem appears uncapitalized, it refers to the generic conceptual variable (however operationalized). The notation "low SEs" or "high SEs" also refer to the conceptual variable.

In theory, a subject's score on the 21-item Beck depression inventory could range from 0-63, with higher scores reflecting greater depression. The overall mean score was 8.90 ($SD = 5.89$). For those in the upper third of the distribution: $M = 15.53$, $SD = 4.67$. For those in the lower third: $M = 3.18$, $SD = 1.38$. Scores on the 18-item Self-esteem scale could range from 18-90, with higher scores reflecting higher self-esteem. The overall mean was 61.19 ($SD = 8.98$). The mean score of the upper third of the distribution was 70.79 ($SD = 4.16$), whereas the mean for those in the bottom third was 51.39 ($SD = 5.51$). Both scales have been used widely in their respective literatures. In a broad overview of Self-esteem measures, Robinson and Shaver (1973) reported that the Janis-Field scale was among the top two available for research on adults. In addition, by now there is considerable evidence attesting to the reliability and validity of the Beck depression inventory (Beck, 1967; Miller & Seligman, 1975).

Participants next worked on an insoluble concept formation task. Specifically, they were shown a board having 32 small boxes. Each box contained five characteristics: size (large or small), shape (circle or square), color (black or white), position (left or right), and quantity (one or two). Subjects were told that the concept consisted of one of these characteristics. The experimenter showed the subject a box that was an example of the concept. The subject then had to determine the identity of the concept by lifting up other boxes, one at a time. If the box was an example of the concept, the word *Yes* had been written on a piece of oak tag below, whereas the word *No* had been written if the box was not an example. Subjects were allowed to lift 15 boxes (or were given two minutes time, whichever came first) to determine the "correct" concept. Subjects wrote their responses on pieces of paper, which the experimenter then collected. All participants attempted to solve three concept formation trials in succession.

Attribution Manipulation. All subjects were randomly assigned to their experimental treatment. In the external ($N = 41$) and internal ($N = 43$) conditions the experimenter called subjects' attention to a bogus performance chart that had been placed on the wall in front of them. The chart described how well 60 "previous participants" had performed. In the external condition, subjects were informed that the task was very difficult, as 35 of the other participants failed to solve a single concept, 22 solved one or two, and only 3 solved all three. In the internal condition, subjects were led to believe that the task was relatively easy, as 35 of the previous subjects had solved all three concepts, 22 solved one or two, and only three solved none. Thus, it was expected that subjects, on encountering failure, would attribute it more to task characteristics (and/or less to self-aspects) in the external than in the internal condition. In the no information ($N = 42$) condition, subjects were given no feedback about the performance of other subjects. Once subjects had begun working on the task the experimenter made comments designed to buttress the attribution manipulation. In between concept formation trials one and two, the experimenter casually mentioned in the external (internal) condition: "Most people say they found the next concept to be harder (easier) than this one." In between trials two and three the experimenter said: "Most everyone says this next one is even more difficult (easier) to identify." No such information was provided in the no information condition.

After completing the third concept formation trial, subjects were told that the first experiment was over. Subjects completed a questionnaire on which they rated the importance of various reasons for their performance on the task. Following Weiner's (1974) attributional analysis of achievement behavior, the perceived impact of ability, task difficulty, effort, and luck was assessed. Subjects made all ratings on 41-point dotted continuua, with endpoints labeled "not at all" (1) and "very much" (41). Subjects also were asked to rate their performance on a 41-point continuum (endpoints: "very poor" (1) and "very good" (41)).

In the control ($N=42$) condition the entire concept formation procedure and the questionnaire were deleted.

Subjects in all conditions then were led to a different cubicle for the next experiment. A second experimenter, blind to the subjects' self-esteem and attribution conditions, mentioned that the upcoming anagrams task was unrelated to the first part of the experiment. Subjects then worked on the anagrams task used by Tennen and Eller (1977). They were allowed 90 seconds to solve each of the 20 anagrams. If unable to solve the anagram within the alloted time, the subjects were asked to attempt to solve the next anagram in the series. The experimenter measured, with a stopwatch, the length of time that subjects used to solve the anagrams.

After the anagram task, subjects were fully debriefed, thanked for their participation, and implored not to speak to other people about the experiment.

Results

The three behavioral dependent variables were: (1) number of anagrams solved, (2) mean time spent working on each anagram, and (3) mean time spent working only on those anagrams that had been solved. The first measure was determined by counting the number of anagrams (out of 20) that subjects solved within the 90-second limit. For the second measure, the mean length of time each subject used to work on all 20 anagrams was recorded. (A score of 90 seconds was assigned to all trials in which the subject did not solve the anagram.) The third measure was determined by computing the mean time spent only on those anagrams that subjects correctly solved.

Two statistical analyses were conducted on each measure. In each instance a two-factor (self-esteem × attribution) unweighted-means analysis of variance (ANOVA) was performed. In order to provide a more powerful test of the effects of the self-esteem variables, only the data from those individuals who scored in the upper or lower thirds of the distributions were employed. Following the procedure of Inkson (1978), who also operationalized dispositional self-evaluation with Self-esteem and depression scales, two analyses of variance were performed on each measure. In one analysis the self-esteem independent variable was determined by the individual's score on the depression measure, and in the other analysis it was determined by the Self-esteem score. The data from 112 (out of the 168) subjects were used in each analysis, although it was not necessarily the case that the identical subjects were used in the depression and Self-esteem analyses.

Manipulation Check

The most direct attribution manipulation check is the perceived task difficulty item. Recall that subjects had been told in the external condition that the task was quite difficult, whereas those in the internal condition were informed that it was rather easy. Those in the no attribution condition were provided no information about the difficulty of the task, and those in the control condition did not complete the task and thus did not respond to the attribution measures. It was predicted that externals would make more of a task difficulty attribution for their failure than internals, and the results in the no attribution condition were expected to fall in between these extremes. A secondary hypothesis was that participants in the external condition would make less effort and/or ability attributions (i.e., internal attributions) for their failure than would those in the internal and no attribution conditions. This latter hypothesis is more speculative in that, contrary to the popular belief of many attribution theorists, situational (external) and dispositional (internal) attributions are not necessarily negatively correlated (Solomon, 1978). That is, if subjects attribute their failure to more external factors, such as task difficulty, it does not mean that they automatically will make less internal attributions. Given that the attribution manipulation consisted of telling participants that the task was either very hard or very easy, the task difficulty manipulation check was expected to be the most sensitive measure.

Depression Analyses. As predicted, subjects attributed their performance more to the difficulty of the task in the external ($M=29.19$) than in the no information ($M=25.48$) or internal ($M=21.39$) conditions [$F(2,75)=4.28, p<.025$]. There was also a marginal tendency for subjects in the external ($M=21.22$) condition to attribute their failure less to the internal dimension of effort, compared to those in the no information ($M=27.81$) and internal ($M=24.04$) conditions [$F(2,75)=2.35, p<.10$]. No other effects were significant on any of the attribution measures.

Self-Esteem Analyses. The pattern of means in the Self-esteem analyses was similar to that in the depression analyses, but the means were not as markedly different from one another. Thus, external ($M=27.52$) subjects made more of an attribution to task difficulty than did no information ($M=26.47$) and internal ($M=23.62$) participants. These differences, however, were not significant. Also, on the effort measure, externals ($M=22.30$) scored somewhat, though not significantly, lower than did internals ($M=26.90$) and no information participants ($M=27.96$). No other effect approached significance.

In sum, the attribution results (particularly in the depression analyses) provided evidence that the subject's failure was seen as due more to the difficulty of the task in the external than in the other two conditions. The Self-esteem results were weaker, perhaps thereby explaining why the results were less pronounced in the (forthcoming) analyses of variance of the performance data.

Table 1
Number of Anagrams Solved: Depression Analysis[a]

	Control	*Internal*	*External*	*No Information*
Low depression	$N = 17$	$N = 8$	$N = 12$	$N = 18$
	$M = 14.41$	$M = 14.38$	$M = 12.08$	$M = 14.39$
	$SD = 2.43$	$SD = 4.47$	$SD = 5.24$	$SD = 3.50$
High depression	$N = 14$	$N = 15$	$N = 15$	$N = 13$
	$M = 13.64$	$M = 12.13$	$M = 16.13$	$M = 11.85$
	$SD = 3.64$	$SD = 4.32$	$SD = 2.58$	$SD = 4.75$

[a] Maximum = 20.

Performance: Number of Anagrams Solved

Depression. The analysis of variance on the number of anagrams solved revealed only a significant interaction effect [$F(3,104) = 3.85, p < .015$]. The means reported in Table 1, as well as simple effect analyses, reflect the interaction. High depressives (i.e., low SEs) solved fewer anagrams than did low depressives (i.e., high SEs) in the control, internal, and no attribution conditions, although none of these comparisons attained significance (largest $F = 2.68, p < .11$). In the external condition, those high in depression performed significantly better than did the lows [$F(1,104) = 6.77, p < .02$]. To state the interaction effect differently, the performance of the high depressives was significantly affected by the attribution variable [$F(3,104) = 3.17$, $p < .05$] with high depressives performing best in the external and worst in the no attribution and internal conditions. By contrast, the performance of the low depressives was not affected by the attribution manipulation [$F(3,104) = 1.11, p > .25$].

Self-Esteem. Highly consistent (but weaker) results were obtained when the Self-esteem variable was substituted for depression. The Self-esteem × attribution interaction was not significant [$F(3,104) = 1.36, p < .25$] but took the same form as the previously reported interaction. Table 2 and simple effect analyses show no differences between Self-esteem groups in the control, internal, and no attribution conditions (all Fs < 1). In the external condition, however, low Self-esteem subjects solved more anagrams than did highs [$F(1,104) = 4.22, p < .05$].

Table 2
Number of Anagrams Solved: Self-Esteem Analysis

	Control	*Internal*	*External*	*No Information*
Low depression	$N = 17$	$N = 14$	$N = 11$	$N = 14$
	$M = 14.59$	$M = 13.50$	$M = 12.46$	$M = 13.14$
	$SD = 2.25$	$SD = 3.79$	$SD = 5.26$	$SD = 4.70$
High depression	$N = 12$	$N = 15$	$N = 16$	$N = 13$
	$M = 13.50$	$M = 13.60$	$M = 15.56$	$M = 13.92$
	$SD = 3.57$	$SD = 4.05$	$SD = 2.94$	$SD = 3.83$

Performance: Time Spent on Anagrams

Overall Analysis. The only significant effect on the depression analysis was the interaction effect [$F(3,104) = 2.86, p < .05$]. Simple effects revealed that high depressives took nonsignificantly longer than did low depressives in the control, internal, and no information conditions, but significantly less time in the external condition [$F(1,104) = 5.04$, $p < .05$]. The Self-esteem × attribution interaction, though not significant, took the same form. Low self-esteem subjects took less time in the external condition than did those high in Self-esteem [$F(1,104) = 4.52$, $p < .05$] whereas there was no difference between the two Self-esteem groups in all other conditions (all Fs < 1).

Secondary Analysis. The analyses on only those anagrams correctly solved yielded no significant effects, although the patterns were similar to those found in the overall analysis. High depressives took marginally less time than low depressives in the external condition [$F(1,104) = 2.73, p < .10$] and slightly more time in the other three conditions. Similarly, low Self-esteem subjects took significantly less time in the external condition than did high Self-esteem participants [$F(1,104) = 4.97, p < .05$] whereas there was no trace of a Self-esteem effect in all of the other conditions.

Correlational Analyses

The results of the (depression) analyses of variance yielded the predicted interaction between self-esteem and attribution. As expected, low SEs performed better in the external relative to all other conditions, whereas the performance of high SEs was not affected by the attribution manipulation. The *within-condition* relationships between self-esteem and performance, however, were not consistent with the earlier speculation. It had been tentatively hypothesized that self-esteem would be positively correlated with performance in the control, internal, and no information conditions and that this relationship would be weakened or even eliminated in the external condition. In fact, high SEs never performed significantly better than low SEs in the control, internal, and no information conditions. Moreover, there was an *inverse* relationship between self-esteem and performance in the external condition. To explore further the within-condition relationships between self-esteem and performance (most notably the unexpected inverse relationship between self-esteem and performance in the external condition), a series of correlations in each of the four experimental conditions was conducted. The data of all 168 subjects were included in these analyses. By including all participants in these analyses, one could determine whether the inverse relationship between self-esteem and performance in the external condition was, in fact, linear. Recall that the ANOVAs included only the data of subjects from the upper and lower thirds of the self-esteem distributions. As a consequence, they reveal nothing about the performance level of subjects having moderate self-esteem.

Table 3
Within-Condition Correlations Between Self-esteem and Performance[a]

	Condition				
Variables	*Internal (N=43)*	*External (N=41)*	*No Attribution (N=42)*	*Control (N=42)*	*z-score (External vs. All Others)*
Self-esteem and anagrams correct	−.02	−.38*	−.16	.20	2.06, $p<.05$
Self-esteem and time spent (all)	.04	.39**	.11	−.18	2.11, $p<.04$
Self-esteem and time spent (correct)	.09	.39**	−.02	−.02	2.12, $p<.04$
Depression and anagrams correct	−.12	.38*	−.06	−.08	2.64, $p<.01$
Depression and time spent (all)	.08	−.32*	.04	.12	2.19, $p<.03$
Depression and time spent (correct)	−.09	−.21	−.02	.17	1.18, $p<.25$

[a]The personality scores are constructed so that for self-esteem, higher scores reflect a more positive self-evaluation. For depression, higher scores reflect a more negative self-evaluation.
*$p<.05$
**$p<.01$

The correlational data were remarkably consistent across all dependent measures, regardless of whether self-esteem was operationalized through the Self-esteem or depression measures. Three key points highlight these results, which are summarized in Table 3: (1) in the external condition there was a significant inverse relationship between self-esteem and quality of task performance. As the analyses of variance suggested, low SEs solved more anagrams, and took less time to do so, than did high SEs; (2) in all other conditions the correlations failed even to approach significance; (3) a comparison between the external condition correlation and the cumulative correlation across the other three conditions was significant at the .05 level. The only instance in which all of the above were not true was in the depression–time correct analyses, in which the external correlation did not attain significance and did not differ from the cumulative correlation in the other three conditions.

Similar to the performance results in the depression and Self-esteem analyses of variance, the correlational data revealed: (1) a significant inverse relationship between self-esteem and performance in the external condition, and (2) no significant self-esteem effects in the remaining three conditions. Moreover, like the significant interaction effects obtained in the depression analyses of variance, (3) significantly different relationships between self-esteem and performance were obtained in the external condition relative to the other three. Finally, (4) unlike what was obtained in the ANOVAs, the Self-esteem results were somewhat more consistently significant than were the depression findings in the correlational analyses.

Additional Analyses

In order to provide the most powerful test of the mediating role of attributions, several additional analyses were conducted including only those two conditions (external and internal) in which deliberate attempts were made to vary subjects' task difficulty attributions for their failure at the concept formation task.

Manipulation Check. A 2×2 (self-esteem × internal-external) ANOVA on the task difficulty manipulation check item revealed in the depression analysis a significant attribution main effect ($p < .025$), with externals attributing their failure more to the difficulty of the task than internals. In addition, a marginally significant interaction effect emerged ($p < .07$). Simple effect analyses revealed that the internal-external manipulation influenced the attribution ratings of the high depressives ($p < .01$) but not the low depressives. The condition means in the Self-esteem analysis were similarly ordered, but no significant differences emerged.

Internal Analyses. The correlation between self-reported (rather than experimentally manipulated) task difficulty attribution and number of anagrams solved then was computed for both self-esteem groups. In both the depression and Self-esteem analyses, high SEs (i.e., low depressives and high Self-esteem participants) manifested no relationship between attribution and performance ($r(18) = .31, p > .10$ and $r(23) = -.04$, n.s., respectively). By contrast, negative self-evaluation subjects (i.e., high depressives and low Self-esteem participants) showed significant positive relationships between the extent to which they attributed their prior failure to task difficulty and the number of anagrams subsequently solved ($r(28) = .45, p < .01$, and $r(29) = .34, p < .05$, respectively). In summary, the manipulation check data reported here provides evidence that the depressed, but not the nondepressed, subjects' task difficulty attributions were significantly altered by the internal-external manipulation. Note that the performance of only the former group was influenced by the attribution manipulation. Moreover, the internal analyses revealed that regardless of their experimental condition, low but not high SEs performed better on the anagrams task to the extent that they attributed their earlier failure to the difficulty of the task.

Other Questionnaire Data

As intended, subjects generally believed that they had performed poorly on the concept formation task (overall $M = 10.14$ in the depression analysis and 10.54 in the Self-esteem analysis). A 2×3 unweighted-means analysis revealed no significant condition differences in the depression analysis. The Self-esteem analysis revealed a significant Self-esteem main effect only, such that high Self-esteem participants perceived that they had done better than lows ($p < .05$).

Discussion

Taken together, the results on the analyses of variance and correlational analyses provide suggestive evidence that the task performance of low SEs can be improved to the extent that they are led to attribute their prior failure to the difficulty of the task, rather than their own personal inadequacy. This finding has a number of practical and theoretical implications.

Practical Implications

Brief and Aldag (1981) have discussed the implications of Bandura's (1977) self-efficacy theory for work performance. Self-efficacy refers to the perception that one will be able to execute the behavior that will produce the desired outcome. Bandura has shown that self-efficacy expectations are positively related to task performance. Brief and Aldag suggested that an "important outcome of the organizational socialization process... should be to establish sufficient levels of self-efficacy expectations in regard to organizationally relevant tasks" (1981, pp. 81-82). Moreover, it would seem most incumbent to do so for low SE employees, who by definition have low self-efficacy expectations. It thus becomes important to identify the factors that could influence low SEs' self-efficacy perceptions. The present data suggest that low SEs' attributions for their failure may be just as important as the failure itself in affecting their self-efficacy. Although failure is inevitably a part of organizational life, failure need not reduce low SEs' sense of self-efficacy, if it *realistically* can be attributed to an external cause. Put another way, low SEs do not inevitably have to fall prey to a vicious cycle of failure.

It should be emphasized that the present authors are not advocating that low self-esteem employees should indiscriminantly attribute all or even most of their previous failures to external factors such as task difficulty. Clinical views of low self-esteem and depression (Seligman, 1975) have noted that people suffering from negative self-evaluation tend to be high in external locus of control (which may contribute, in fact, to their negative self-evaluation). One would hardly recommend that they become even more external in their outlook. For their longer term mental health, it may be equally important for their attributions to be veridical. Thus, it is suggested that low SEs' natural tendency to make internal attributions for failure may generalize to situations in which such self-blaming is clearly inappropriate (as in the present study, in which the failure inducing task was insoluble). The external attribution manipulation was intended to reduce the low SEs' natural tendency toward self-blame for failure and thereby enable them to perform better at the anagrams task. Additional research should explore the consequences of encouraging low SEs to make external, but inaccurate, attributions for their failures. It may be that such a denial of reality may have beneficial effects on subsequent task performance in the short run, but could produce disastrous long term effects (as in the case of faltering employees who fail to take self-corrective action because of a tendency to externalize inappropriately the cause of their failure).

Of course, a task of great practical importance is to specify the conditions under which low SE employees can make more external/less internal attributions for their failures. As in the present study, managers may use social comparison information, suggesting to the worker that most people had fared poorly on the task at which the employee had encountered difficulty. Or, if the failure occurred on a task performed on a group rather than on an individual basis, the manager could suggest to the low SEs that they were not the sole cause of the setback. If the manager is unwilling or unable to encourage low SE employees to make more external attributions for their failures, then perhaps the employees can be given *self*-regulation training on how to make more external attributions for temporary setbacks. Attribution theorists have shown, for example, that individuals' explanations for their performance are related to their attentional focus (Buss & Scheier, 1976). Those who were high in self-directed attention made more internal/less external attributions for their failures than did those whose attentional focus was more external. If low SEs were trained to redirect their attentional focus from internal (i.e., self) to environmental factors following failure, then their attribution for that failure might be similarly affected.

Theoretical Implications

At the outset it was mentioned that the relationship between an individual's level of self-esteem and task performance frequently is positive. The present data, along with several other recent findings, suggest that under certain specified conditions there may well be an *inverse* relationship between self-esteem and performance. For instance, when instructed to attend diligently to the task, low SEs performed better than did high SEs in one study (Brockner & Hulton, 1978). Or, when tested under nonevaluative conditions, high test anxious individuals (who also tend to be low in self-esteem) outperformed those low in test anxiety (who also tend to be high in self-esteem) (Sarason, 1972). Similarly, the present experiment has provided evidence that high depressives (or low SEs) performed significantly better than did low depressives (or high SEs) when their prior failure was due to task difficulty.

It is important to note that these relatively rare inverse relationships between self-esteem and performance are due partially to the data of the high SEs. The very experimental treatments that cause a significant improvement in the performance of the low SEs tend to produce at least a slight impairment in the functioning of the high SEs. For example, in the present study the external attribution caused the high depressives to improve significantly, but it produced a nonsignificant decline in the performance of the low depressives. Thus, the net effect of these two processes was an overall negative relationship between self-esteem and performance. Similarly, Brockner and Hulton (1978) observed that instructions advising subjects to concentrate on the task at hand caused low SEs to perform significantly better and high SEs to do slightly worse. One practical implication of these findings is that the manager would be well advised to take into account his employees' level of self-esteem before attempting to alter their cognitive processes in the work performance situation. The practices that may be helpful to the low self-esteem employees may have little or no effect on the high SEs.

In summary, the present results join a growing list of studies implicating the importance of cognitive processes in the maintenance (and possible alteration) of low self-esteem. By boosting their prior expectancies (Sigall & Gould, 1977), shifting their attentional focus from self to task (Brockner & Hulton, 198), and now altering their attribution for an earlier failure, low SEs may come to respond in a more positive manner (i.e., renewed effort, increased performance) in achievement settings. Future research should explore the ecological validity of the present findings. That is, are low self-esteem employees less productive than their high self-esteem counterparts? If so, is it possible to boost the motivation and performance of the low SEs by cognitive techniques? Moreover, if their performance does improve, does this mean that their self-esteem will automatically improve? The answers to these provocative questions await further experimentation.

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The Socialization of Expatriate Managers in Multinational Firms

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The use of home country nationals is restricted in international operations partly because of differing attitudes in the host country. This study employed the concept of socialization to predict that expatriates partially adopt host country attitudes. Results support the socialization predictions and suggest the need for further examination of actual expatriate performance.

A continuing problem in firms operating across international borders is determination of the preferred nationality mix of executives in foreign subsidiaries. The problem has at least four dimensions. The cost of staffing with parent country or third country nationals usually is different and frequently higher than staffing with nationals of the host country; political and motivational considerations also may dictate use of the maximum number of host country nationals; host country nationals best understand the ways of their country and may be able to function more effectively in that environment. Contrariwise, the firm's interests in rotational training of managers and in centralized control work against the use of host country nationals (Newman, Bhatt, & Gutteridge, 1976; Ziera & Harari, 1977).

Consistent with the analysis above, Tung's (1979) review of the personnel policies of 80 American firms operating overseas found that cultural familiarity, public relations, and cost constituted the key reasons for staffing with nationals of the host country, and expertise was cited as the major force behind the use of parent country nationals. Only four of the firms in her study examined the actual "relational" skills of a manager—the ability of the manager to understand and operate in another culture—prior to overseas assignment, despite the potential usefulness of these skills in helping an American expatriate cope with the business and social environment of a foreign operation (Hays, 1974; Miller, 1972). Not surprisingly, lack of those abilities was a key reason for later failure of expatriate managers in the firms that Tung sampled.

The present study was designed to examine management related cultural attitudes in detail. Many earlier studies have noted that management attitudes are culture related and argue that expatriates understand their own cultures but often not those in which they operate. In contrast with earlier work, the present study investigated cultural socialization, predicting that expatriates would come to adopt attitudes between those of the parent and the host country. If correct, the prediction suggests that expatriates can function better on an interpersonal level than previously anticipated. The prediction rests on two bodies of research: one finding important attitude differences among nationals of different cultural groups, and another examining the cultural learning process, or socialization.

Haire, Ghiselli, and Porter (1963, 1966) surveyed 2,800 managers in 11 developed countries, questioning them concerning management related leadership beliefs, cognitive patterns, and motivation levels. The results were revealing in two ways. On many questions, there were only narrow differences across the range of countries. Nevertheless, where significant differences existed, the responses of managers within a cultural group clustered with one another (e.g., the responses of English and American managers were similar); and each cluster behaved differently from others (e.g., the responses of Scandinavian managers differed from those of the English-U.S. group).

Similar patterns of culturally based differences have since been observed by other researchers. Redding and Casey (1976) found that managers in eight Asian countries had quite different belief patterns from one another. Working with a sample of 1,768 managers in a single multinational firm, Griffeth, Hom, DeNisi, and Kirchner (1980) found that 52 percent of the variance in management attitude could be accounted for by nationality. Both culture and level of industrialization were found to be important to the values of managers in five nations by Whitely and England (1977).

How did the managers in each nation or culture learn their differing attitude systems? At the most basic level, these systems might be understood either as normative roles that are played out whenever the need to behave or think "like a manager" seems called for, or as reflections of self-concept—managers' beliefs about themselves. Roles generally are learned most rapidly through observation, repeated practice, and the receipt of reinforcement for carrying out a consensual role appropriately (Bandura, 1977; Jackson, 1965; Larwood & Wood, 1977). Thus people who live in a culture are most likely to be able to observe the behaviors that will be expected of them by others. They can engage in anticipatory socialization—obtaining advance information and adopting the expected role—even prior to joining an organization or its management hierarchy, thus ensuring that later they will be rewarded for carrying the role out appropriately (Feldman, 1981).

Managers who know themselves and their abilities well are better able to use their abilities to obtain reinforcement. Thus people may be driven to understand themselves (Epstein, 1973) and to resist needless self-concept change. Because self-concept is intended to be explanatory, however, it can change through the discovery of one's self behaving in a manner incongruent to prior self-concept when there seems to be insufficient external justification for the behavior (Bem, 1972). Consequently, adults preferably avoid potentially incongruent and compromising situations of conflict between self-concept and role.

It was predicted that attitude systems, such as those lodged in role learning and self-concept, change for expatriates in the direction of the systems of host country nationals. For the reasons described earlier, expatriates usually work closely with host country nationals, who provide alternative role models to parent country attitudes and behavior. In order to maximize their level of reinforcement in social interactions, expatriates may be forced to make some changes in their own behavior. Having done this, they may incur parallel self-concept changes (Bem's "self-perception" process), which will bring them into greater agreement with the way of thinking of members of the host country.

Expatriates who attempt to avoid resocialization may find themselves facing conflicting demands (internal and external), may be unable to communicate effectively with host country nationals, and may be less satisfied with their situation (Korman, Wittig-Berman, & Lang, 1981). These, in turn, are the archetypal conditions for the first or "unfreezing" stage of resocialization in some models of learning (Lewin, 1947; Schein, 1968).

In sum, then, the following three hypotheses were developed:

1. *Korean and American managers, having different cultural backgrounds, also have different managerially related attitudes derived from their cultures.*
2. *American expatriates in multinational firms operating in Korea have been partially resocialized by their experience; expatriate attitudes are closer to those held by Koreans than are the attitudes of American managers in the United States.*
3. *Job satisfaction of American expatriates in Korea correlates with their agreement with managerially related attitudes typifying Korean culture.*

Method

Respondents and Design

Three respondent groups were examined in this study. The American expatriate group consisted of 33 members of the American Businessman's Association in Seoul (of 60 who had been invited to participate). A Korean comparison group was composed of 105 managers in 8 multinational firms operating in Seoul (of 120 invited). An American comparison group contained 74 members of a university operated executive training program for mid- to upper-level executives (of 120 invited). The groups necessarily were somewhat different from one another. The expatriate group was more likely to be employed in a financial organization, in a smaller unit, and at a higher organizational level than the other groups. The American comparison group had more education and more years of management experience.

Respondents were solicited by mail, asking their participation in a study "comparing American and Korean managers in their ways of perceiving the business and social environment." Participants were promised anonymity.

Instrument

The four page questionnaire consisted of two sections. The first asked for background information including level and experience. It also asked respondents to evaluate their work satisfaction (a single item scored 1 to 7). The second section consisted of 40 attitudinal questions, with 8 questions each designed to probe 5 dimensions of potential Korean-American differences.

Questionnaires were administered in both Korean and English. The original version, prepared in English, was translated to Korean, then back-translated by a different individual to be certain that its integrity had been maintained.

Attitudinal Questions

In order to obtain attitudinal dimensions on which the American and Korean comparison groups were likely to differ, an extensive literature review was conducted. This resulted in a list of 18 prospective dimensions, including for example: acceptance versus resistance to change, superstition versus rationalism, and self-abasement versus superiority.

Serving as a panel were 36 American and Korean business students who were asked to list probable differences between Korean and American cultures. Those who listed at least five factors then were asked to examine the 18 dimensions obtained from the literature and to determine a small number of representative dimensions that include the most important cultural features from the original dimensions.

Five dimensions resulted:

1. nonmaterialism versus materialism
2. security versus achievement needs
3. harmony versus competitiveness
4. reflective versus active
5. subjective versus objective relationship oriented

("Reflective" in the above list refers to the tendency to reflect before making decisions; "active" is the tendency to act quickly and decisively. A complete copy of the questionnaire used may be found in Lee, 1982.)

Each of these five dimensions then was split, in the belief that one might, for example, believe in both harmony and competitiveness at the same time. Five questions that appeared to represent each end of each dimension

(Copeman, 1971; Haire et al., 1966; Harris & Moran, 1981; Mitchell & Moudgill, 1976) later were examined by the same management students.

The most appropriate questions describing each of the ten poles were retained for the final instrument. In its completed form, the instrument contained 40 questions, such as "My company depends on incentive and competition for its success" (competitiveness), and was scaled from 1 (strong disagreement) to 7 (strong agreement). Post hoc examinations of item intercorrelations for the poles confirmed that all items for any pole related positively with one another [mean $r(210) = .355$, $p < .001$]; in subsequent analyses the items describing a pole were combined into a single scale value (mean scale coefficient $\alpha = .648$).

Results

Group means for each of the 10 scales appear in Table 1. The first hypothesis predicted that Americans and Koreans would differ from one another on the attitudes tested. The hypothesis was examined by analyses of variance for nationality. As noted in the second from last column of Table 1, Hypothesis 1 was supported by 9 of 10 tests in which the Koreans were compared to the two groups of American nationals combined. A similar tendency ($p < .10$) existed in the final (objective relationship) comparison.

The second prediction, that the attitudes of American expatriates fall *between* those of Koreans and Americans in their respective nations also was supported in 9 of the 10 cases ($p < .05$ by a two-tail binomial test comparing the 9 expatriate means within the Korean-American range with the 1 mean outside that range). In order to examine the attitudes more closely, two additional types of test were carried out. Analyses of variance for

Table 1
Attitudes of Korean, American Expatriate, and American Managers[a]

Dimension (Coefficient α)	*Korean Managers in Korea* $\bar{X}$ *(n = 105)*	*U.S. Expatriate Managers in Korea* $\bar{X}$ *(n = 33)*	*U.S. Managers in the U.S.* $\bar{X}$ *(n = 74)*	*Nationality F*	*Location F*
Nonmaterialism (.818)	5.66a	3.60b	3.41b	132.34**	1.15
Materialism (.490)	3.54a	4.35b	4.89c	21.85**	8.82**
Security (.853)	5.57a	3.14b	3.02b	202.21**	.51
Achievement (.576)	4.01a	4.58b	5.21c	23.03**	11.42**
Harmony (.791)	5.85a	3.20b	3.26b	156.10**	.09
Competition (.675)	3.37a	4.58b	4.92b	59.98**	4.57*
Reflective (.751)	4.85a	3.05b	2.96b	154.92**	.34
Active (.422)	4.01a	4.55b	4.95b	8.14**	3.38
Subjective relationship (.673)	4.91a	3.47b	3.20b	73.32**	2.40
Objective relationship (.436)	3.74a	4.04a	4.94b	3.06	24.98**

[a] Within any row, means with different letters differ from one another at .05 or better by a Scheffé test.

*$p < .05$
**$p < .01$

location (in which all respondents in Korea were compared to the American managers in the United States—see the final column of Table 1) reached significance in just 4 of 10 tests. Subsequent Scheffé tests of the significance of this difference for each dimension, however, showed that although American expatriates were reliably different from American managers in the United States in only 3 of the 10 cases, they differed significantly from Korean managers in 9 cases.

In sum, the attitudes of the American expatriates do appear to fall between those of Korean and American managers in their home countries—although they bear substantial similarity to both the American and Korean comparison groups. Nonetheless, overall, expatriate attitudes seem less likely to differ from those of the parent than from those of the host country.

The final prediction asserted that expatriates' work satisfaction correlates with their acceptance of attitudes typifying Korean culture. Table 2 lists the satisfaction-attitude correlations for the three manager groups. Job satisfaction was scaled from 1 (low) to 7 (high). As can be seen in Table 2, satisfaction did correlate reliably with the dimensions for expatriates in the manner anticipated. For example, Koreans indicated a greater concern than did Americans with subjective relationships, and American expatriates who were more satisfied with their jobs also were more concerned with such relationships. In contrast, neither of the two comparison groups consistently showed this relationship.

The finding is limited, however, to the five scales on which Koreans tested high. For the opposite ends of the original dimensions (for example, objective relationship in contrast to subjective) on which American nationals scored high, no reliable relationship was found. It may be that the American expatriates who were more satisfied were adapting to what they saw as the positive points of Korean culture, without abandoning the related, but not necessarily conflicting, elements of American culture.

Table 2
Correlation of Attitude with Job Satisfaction

Dimension[a]	*Korean Managers in Korea (n = 105)*	*U.S. Expatriate Managers in Korea (n = 33)*	*U.S. Managers in the U.S. (n = 74)*
Nonmaterialism	.02	.47**	.13
Materialism	.10	.15	-.00
Security	.17	.36*	.00
Achievement	.07	.09	.02
Harmony	.07	.49**	.23*
Competition	.10	.19	.10
Reflective	-.03	.45**	-.09
Active	.15	.06	-.04
Subjective relationship	.09	.35*	.08
Objective relationship	-.03	.14	.10

[a] Attitude dimensions were scaled with high numbers indicating agreement; satisfaction was measured by one item asking what is "your satisfaction at your workplace" scaled with high numbers indicating high satisfaction.

*$p < .05$ by a two-tail test of Pearson's r.

**$p < .01$ by a two-tail test of Pearson's r.

Additional analyses examined the relationships between the general background items and responses to the attitude questions. Although the groups differed somewhat in background, these differences bore no overall relationship to the hypotheses. Nonetheless, it is noted that among American expatriates, those in manufacturing industries (of whom there were relatively few in this study) were more likely than expatriates in other industries to be reflective [Pearson's $r(31) = -.40, p < .05$ by a two-tail test] and less concerned with objective relationships ($r = -.35, p < .05$)—somewhat paralleling Korean attitudes. (Although this analysis relies on dummy binary codings that traditionally are not considered acceptable for parametric tests, the latter can be used without correction for $n \geq 11$; Edwards, 1982.) Also among American expatriates, level of education correlated negatively with attitudes regarding concern for materialism ($r = -.34, p < .05$) and subjective relationships ($r = -.44, p < .05$). Although the first relationship brought the better educated expatriates closer to the Koreans, the second moved them away and toward American managers in the United States.

Discussion

This study has examined the managerially related attitudes of Korean, American, and American expatriate managers. Confirming earlier studies (England, 1973; England & Lee, 1971), American and Korean managers were found to have substantially different value systems.

The focus of the present research differed from previous work, however, in its concern with expatriate managers and their socialization. The attitudes of American expatriates in Korea were found to be midway (closing 26 percent of the gap) between those of Korean or American managers in the two comparison groups.

From a theoretical point of view, that result can be predicted by socialization research. The latter has found that individuals who seek to maximize their reinforcement levels attempt to behave in ways deemed appropriate by those with whom they interact. Those who carry out the new roles most readily expose themselves to the possibility of self-concept change in which they adopt attitudes supporting their new behaviors. Individuals who more easily adopted Korean attitudes were predicted and found to be relatively more satisfied with their work than those who had made less adjustment.

Of course, it may be argued that U.S. nationals who select assignment in Korea and are happy with such an assignment have an attitude system that already approaches that of Koreans. Self-selection, rather than socialization, might cause the relationships seen in this study. That explanation is of only limited use, however. Pacific rim cultures often have quite different attitudes from one another (Redding & Casey, 1976), and it would be difficult for an outsider to recognize the particular attitude set he or she would encounter in Korea. As well, analyses of the reasons for selecting overseas assignments give no hint of underlying attitude differences

(Miller & Cheng, 1976; Miller & Hill, 1978). The reasons for selecting an overseas assignment have little to do with the attitudes of managers in the host country.

More study would be useful, however, in two ways. Because of cultural inhibitions with some questions and the constraints of instrument length, the present study was unable to examine the dynamics of the cultural resocialization process. In the future, it would be of interest to learn over what period of time resocialization occurs. Also, can resocialization be artificially enhanced through training or through critical events of some type; is a particular personality type more willing to accept resocialization; is the long term expatriate increasingly adaptable in other foreign assignments, or does he or she refreeze in each new pattern?

Additional study also would be useful from the practical side. The current results imply that parent country nationals have less of a cultural disadvantage (relative to host nationals) than previously assumed. There may be a loss as well, however. In adopting some of the host country attitudes, expatriates may increasingly resemble third country nations, or they may increasingly alienate themselves from the attitudes and policies of their parent country.

Contrariwise, both the socialization and the satisfaction relationships were obtained most prominently for the attitude dimensions preferred by Koreans more strongly than by Americans. Attitudes preferred by Americans over Koreans were not readily dropped by the expatriates, nor was preference for those attitudes correlated with satisfaction. This unanticipated finding may indicate that expatriates deliberately seek an accommodation with the host country that does not alienate them from important values in their country of origin. Further research is needed to determine the exact nature of this finding and how it influences expatriate performance.

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The Effects of Perceptual Congruence and Sex on Subordinates' Performance Appraisals of Their Managers[1]

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In an investigation of the relationship between subordinates' perceptual congruence (SPC) and sex on subordinates' performance appraisals of their immediate managers, SPC was found to be significantly related to subordinate evaluations of their managers within particular manager-subordinate sex combinations. These results are explained in terms of reinforcement theory and the role episode model.

Investigations of interpersonal processes within manager-subordinate dyads have tended to focus on the effects of: (1) attitude similarity within the pair on managers' appraisals of their subordinates (Miles, 1964; Senger, 1971); (2) behavioral similarity between managers and subordinates on subordinates' evaluations of their managers' competence (Weiss, 1977); and (3) subordinate awareness of managers' attitudes on subordinates' job satisfaction and on the performance evaluations they receive from their managers (Greene, 1972; Howard, 1968; Labovitz, 1972). A distinction has been made in this literature between *actual similarity*, which is the difference between managers' and subordinates' descriptions of themselves on various work related behavioral or attitudinal dimensions, and *subordinates' perceptual congruence* (SPC), which is the extent to which subordinates accurately perceive their managers' work related attitudes. In a recent field investigation, Wexley, Alexander, Greenawalt, and Couch (1980) compared

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the relative importance of actual similarity and SPC within 194 manager-subordinate dyads. They found that actual similarity was a relatively weak predictor of subordinates' satisfaction as compared to SPC.

None of the research to date on subordinates' perceptual congruence has examined the relationship between SPC and subordinates' appraisals of their managers. This represents a serious gap in the literature on interpersonal processes within manager-subordinate dyads for several reasons. First, it has been shown that subordinates' evaluations of their managers are related to subordinates' work related attitudes (Fleishman & Harris, 1962). Second, subordinate appraisals of their managers have been shown to be useful for providing developmental feedback to managers (Maloney & Hinrichs, 1959). And, third, managers' salary increases and opportunities for promotion can depend, in some organizations, on how their subordinates evaluate them (Bush & Stinson, 1980). Thus, investigating some of the potential influences on subordinates' evaluations of their managers is felt to be an important area of research to pursue. One purpose of the present study was to examine one such potential influence. Specifically, one aspect of the quality of the manager-subordinate dyadic relationship, as measured by SPC, was assessed in order to determine its relationship to the performance appraisals that subordinates give their managers. It would seem logical that the nature of this interpersonal relationship should relate to subordinates' ratings of their superiors.

Another possible influence on subordinate evaluations of their managers, that is, sex composition of the dyad, also was examined. Many studies that have investigated subordinate ratings of their managers' consideration and initiating structure have found differential ratings of managers as a function of the sex of the manager and sex of the subordinate. However, the pattern of results across these studies has been inconsistent (Bartol & Butterfield, 1976; Brown, 1979; Petty & Lee, 1975; Petty & Miles, 1976; Wexley & Hunt, 1974). In light of these inconsistent results and the increasing number of women who now supervise male as well as female subordinates (Terborg, 1977; Terborg & Shingledecker, in press), it was considered important to examine the relationship between SPC and subordinates' appraisals of their managers separately for the four possible manager–subordinate sex combinations (i.e., male-male, male-female, female-female, female-male).

Finally, evidence of differential responses toward male and female leaders by male and female subordinates has been demonstrated in laboratory studies characterized by short durations of interpersonal contact (Adams, 1978; Bartol, 1975; Cohen, Bunker, Burton, & McManus, 1978). However, attempting to study phenomena such as manager-subordinate interpersonal relationships in a laboratory setting is quite difficult because of the time typically required for most interpersonal relationships to develop. The present research therefore was conducted in a field setting using a large number of manager-subordinate dyads whose members had worked together for at least a four-month time period.

Method

Subjects

The sample was comprised of 286 manager-subordinate dyads, representing manufacturing ($n = 31$), retailing ($n = 21$), government ($n = 33$), and service ($n = 201$) organizations. The 201 service organizations included banks, hospitals, restaurants, and hotels. These data were gathered from organizations in three midwestern and one eastern state.

The total sample of managers was composed of 130 males and 156 females, all of whom were chosen from approximately the same organizational level (i.e., first or second level supervision) in order to control for sources of unreliability due to raters from varying organizational levels (Borman, 1974). Male and female managers were recruited specifically so that they were comparable in terms of years of supervisory experience (8.8 and 7.8 years, respectively); number of subordinates supervised (9.3 and 9.8); number of years in present managerial position (6.4 and 5.0 years); and amount of time the manager had supervised his or her subordinate (1.7 and 1.8 years). Male and female managers also were recruited so as to be comparable in terms of the types of organizations they represented and the functions held.

The total sample of subordinates consisted of 110 males and 176 females, of whom 49 males and 47 females supervised others. A large majority of these subordinates (65 percent of the males and 61 percent of the females) ranged in age from 18 to 29 and were employed on various jobs such as waiter/waitress, computer programmer, personnel administrator, and clerical worker. The number of dyads in the four possible manager-subordinate sex combinations were as follows: male-male (53), male-female (77), female-female (99), and female-male (57).

Development of the Rating Scales

Behavioral observation scales (BOS) for rating managers' leadership performance were developed from procedures suggested by Latham and Wexley (1977, 1981). These behaviorally based performance appraisal measures were constructed to assess the following four leadership factors proposed by Bowers and Seashore (1966):

1. Support. Behavior that enhances a subordinate's feelings of worth and importance.
2. Work facilitation. Behavior that helps each subordinate achieve goal attainment by activities such as scheduling, coordinating, planning, and providing necessary resources and tools.
3. Goal emphasis. Behavior that stimulates enthusiasm within the work group for meeting goals and achieving excellent performance.
4. Interaction facilitation. Behavior that facilitates developing close, mutually satisfying relationships within the work group.

Initially collected were 225 critical incidents representing both effective and ineffective managerial behaviors. Of these incidents, 135 were modeled after items appearing on existing leadership questionnaires such as the LBDQ-XII (Stogdill, Goode, & Day, 1962) and the Survey of Organizations (Taylor & Bowers, 1974). The remaining incidents were obtained from interviews conducted with 35 full time employees who were asked to identify various effective and ineffective behaviors exhibited by their managers.

A questionnaire containing the incidents then was administered to 40 employed business students at Michigan State University. The students were asked to reclassify each incident to the one category that they felt best described it and to rate each incident on a 7-point scale that ranged from 7, outstanding leadership performance, to 1, poor leadership performance. Incidents were retained only if there was high interjudge agreement (i.e., standard deviations of 1.5 or less) and if their means were less than 3 or greater than 5. These procedures resulted in 124 critical incidents.

A revised questionnaire then was sent to 25 managers, each with a minimum of 10 years of managerial experience. They were asked to perform the same reclassifying and scaling procedures described above. Critical incidents that did not have reclassification percentages greater than 95 and standard deviations less than .5 were deleted. The final instrument contained 75 randomly ordered items (support = 23, work facilitation = 22, goal emphasis = 18, and interaction facilitation = 12). Two examples of the BOS items follow:

Defends my actions to others when I am right.						
Almost Never	0	1	2	3	4	Almost Always
Takes the credit for work I have done.						
Almost Never	0	1	2	3	4	Almost Always

Attitudinal Congruence Measures

Attitudes of managers and subordinates were measured by means of a semantic differential approach (Osgood, Suci, & Tannenbaum, 1957). This particular technique was chosen in order to examine manager-subordinate perceptual processes and at the same time to minimize the transparency of the measurement process. Based on their strong effects in previous dyadic research, two concepts, responsibility and loyalty, were chosen for measurement using the semantic differential method (Wexley et al., 1980). For each concept, four bipolar adjective scales were selected from Osgood et al. (1957) to represent each of the three factors of semantic meaning (i.e., evaluation, potency, and activity), thereby resulting in 12 bipolar adjective pairs for each concept. One important consideration in choosing the bipolar adjective scales was their relevance to the particular concept being measured. Moreover, to insure that response set tendencies would be minimized, the bipolar scales were altered in terms of polarity, and the order of factor representation was randomized within each of the concepts. Managers and subordinates were asked to check 1 of 7 rating positions for each of the 12 bipolar adjective pairs on the responsibility and loyalty concepts.

The semantic differentials (manager self-description and subordinate description of the manager) reflecting loyalty and responsibility were used to provide operational measures of attitudinal congruence. The discrepancy between two semantic differentials was measured by using the generalized euclidean distance measure (D), which is based on absolute difference scores (Cronbach & Gleser, 1953). It was computed to obtain a measure of SPC within each of the 286 manager-subordinate dyads. Specifically, SPC can be thought of as the difference between a subordinate's description of the manager and the manager's self-description. SPC was calculated for each of the two concepts, with lower D scores indicating greater subordinate perceptual congruence.

Procedure

Upper level managers at 20 organizations were contacted for permission to conduct the research in their firms. After permission was obtained from 17 of these managers, samples of first and/or second level supervisors were mailed a short biographical information form together with the semantic differentials. The semantic differential instructions asked the managers to describe themselves as accurately as possible in terms of their responsibility and loyalty. The managers were asked to complete the materials and return them by mail to the researchers. The return rate from the managers was 98 percent.

In addition, managers were asked to distribute a package of materials to a randomly chosen subordinate who had close contact with the manager and who was willing to participate in the research. (If managers had failed to follow random procedures and only approached employees who were likely to provide positive ratings, this would likely attenuate rather than enhance the BOS-SPC relationship.) The subordinate's package of materials contained a short biographical information form, the performance appraisal scales, and the semantic differentials. Subordinates were instructed to complete the semantic differntials *not* as they thought their managers would, but rather to describe their managers from their own points of view in terms of responsibility and loyalty. They also were asked to evaluate their managers as accurately and candidly as possible using the BOS. They were told to mail the completed forms directly back to the researchers and were assured that all data would be held in strict confidence. The return rate from subordinates was 93 percent.

Results

The alpha coefficients for the BOS were as follows: support (.92); work facilitation (.89); goal emphasis (.86); interaction facilitation (.85); and total BOS (.96). The alpha coefficients for the difference scores were .90 for responsibility and .78 for loyalty.

Table 1
Means and Standard Deviations of the SPC and BOS Variables for All Dyads and Each Manager-Subordinate Sex Combination

Variable	*SPC (Responsibility)*	*SPC (Loyalty)*	*BOS*
All	5.48	6.00	10.85
	(3.14)	(2.63)	(2.54)
M-M	5.24	5.72	10.72
	(2.97)	(2.38)	(2.58)
M-F	5.78	6.70	10.37
	(3.18)	(3.32)	(2.83)
F-M	5.50	5.89	10.81
	(3.07)	(2.42)	(2.42)
F-F	5.24	5.72	10.72
	(2.97)	(2.38)	(2.58)

In order to assess the relative independence of the two semantic differential concepts, the correlation between the difference scores for responsibility and loyalty ($r = .46$) was computed. Computed also were the intercorrelations among the BOS subscales. Because the average intercorrelation among the subscales was somewhat high ($r = .76$), data are reported only for the 75-item total BOS measure. The means and standard deviations of the SPC and BOS measures are presented in Table 1.

To examine the means of the SPC and the performance appraisal measures across the four sex combinations, multivariate analysis of variance (MANOVA) was used. These analyses revealed no significant main effects or interactions for sex of manager and sex of subordinate on the BOS or SPC measures. Further, Bartlett's test for homogeneity of variance in groups with unequal degrees of freedom (Winer, 1971) revealed no significant differences in the variances for either the SPC or BOS concepts among the sex groups.

The first column of Table 2 shows the zero-order correlations between SPC and the BOS performance ratings for all 286 dyads as well as for each of the four manager-subordinate sex combinations. These zero-order results clearly show that SPC is significantly related to subordinates' performance appraisals of their managers.

To analyze the independent contribution of each of the component parts of the difference scores—that is, subordinates' descriptions of their managers (SDM) and managers' self-descriptions (MSD)—a first-order partial correlation procedure recommended by Wall and Payne (1973) and Weiss (1977) was used. Specifically, correlations were calculated by partialling out each of the two component measures of subordinate's perceptual congruence (SDM and MSD) from the relationship between SPC and BOS (see column 2 of Table 2 for these first-order partials). The results showed that after partialling out MSD, all correlations between SPC and BOS remained highly significant for both the responsibility and loyalty concepts. When SDM

Table 2
Zero-Order and First- and Second-Order Partial Correlations Between SPC and BOS for All Dyads and Each Manager-Subordinate Sex Combination

Variable	*SPC,BOS*[a]	*D,BOS.MSD*[b]	*D,BOS.SDM*[c]	*D,BOS.SDM,MSD*[d]
Responsibility				
All	−.58***	−.60***	−.35***	−.37***
M-M	−.37**	−.47***	−.23*	−.30**
M-F	−.53***	−.54***	.02	.07
F-M	−.68***	−.68***	−.14	−.14
F-F	−.65***	−.64***	−.53***	−.53***
Loyalty				
All	−.47***	−.52***	−.39***	−.41***
M-M	−.29**	−.46***	−.21	−.37**
M-F	−.53***	−.57***	−.36**	−.29*
F-M	−.57***	−.58***	−.33**	−.25*
F-F	−.42***	−.45***	−.47***	−.48***

[a] Zero-order correlations between SPC and BOS.
[b] First-order partials with managers' self-description partialled out.
[c] First-order partial correlations with subordinates' description of their manager partialled out.
[d] Second-order partial correlations with SDM and MDS partialled out.
*$p<.05$
**$p<.01$
***$p<.001$

was partialled out of the SPC-BOS relationship, all except three correlations remained significant (see column 3).

Finally, in order to assess further whether the *difference* between SDM and MSD (i.e., SPC) was actually relating to the BOS or whether one or the other of the two components was responsible for the significant results, second-order partial correlations were calculated by simultaneously partialling out both components of the perceptual congruence measure. That is, this procedure controlled for the effects of both SDM and MSD. The results of these second-order partials (see column 4) show that in all but two cases the relationship between SPC and BOS remained significant. The nonsignificant second-order partials were found in the male-female and the female-male dyads for the concept of responsibility. Given these results, statistical tests of the differences between the second-order partials of mixed-sex and same-sex dyads for each of the concepts were conducted. Significant differences were found for responsibility ($z=2.68$, $p<.05$) but were not found for loyalty.

Discussion

The results of the present study indicate that the more cognizant a subordinate is of his or her manager's work-related attitudes, the more favorably the subordinate appraises the manager's leadership performance. Further, this phenomenon seems to occur reliably in similar-sex dyads but is not as consistent in mixed-sex dyads. It is noted that these results are consistent with previous laboratory research that has shown various differential responses toward male and female leaders by male and female subordinates (Terborg, 1977).

One plausible explanation for these results is that congruent perceptions of another person's work-related attitudes is a positively reinforcing experience. That is, seeing one's manager as the manager sees himself or herself allows a subordinate to reduce uncertainty and ambiguity by better understanding of the superior's attitudes and, hence, better anticipation of the manager's future behavior (Wexley et al., 1980). This state of perceptual congruence is most likely brought about by a process of role sending, whereby a manager communicates to a subordinate certain verbal and nonverbal cues regarding his or her work related self-attitudes. The accuracy with which a subordinate can perceive these attitudes is a function of both the sensitivity of the subordinate and the openness and consistency of the manager in sending these messages (Katz & Kahn, 1978).

Given the results of the present research together with the findings from previous SPC related studies (Wexley et al., 1980), it seems that interventions aimed at improving the quality of manager-subordinate dyadic relationships via SPC could produce beneficial outcomes. After all, SPC has been shown to relate to managers' performance appraisals of their subordinates, subordinates' satisfaction with their managers and their work, and subordinates' performance appraisals of their managers.

Although an attempt was made to use a wide variety of organizational settings and job types, the fact remains that the vast majority (i.e., 70 percent) of the manager-subordinate dyads used in this study were drawn from service organizations. Therefore, the generalizability of these results remains to be demonstrated in other types of organizational settings. It should also be noted that the present research design was influenced by common method variance insofar as both SDM and BOS measures were collected from subordinates at one point in time using a single questionnaire. In light of this problem, partial correlations were used to examine carefully the unique contribution of each component (i.e., SDM and MSD) of SPC's relationship with subordinates' performance appraisals of their managers. Finally, it was not the intent of this research to examine the causal nature between SPC and BOS. The correlational nature of this study precludes any inferences about whether subordinates' performance appraisals of their managers are higher because they understand their managers or because effective managers help their subordinates to understand them better.

Besides examining the causal linkages within manager-subordinate dyads, future research using the concept of SPC should be conducted along several diverse lines of inquiry. First, there currently is no research to be found on the *accuracy* of ratings for those manager-subordinate pairs where there is a strong, supportive relationship within the dyad. It would seem that the relationship between SPC and the accuracy of ratings would be a fruitful area of research. For instance, would a close relationship between a manager and subordinate increase the accuracy of performance ratings or would it merely inflate halo and leniency errors? Most performance appraisal research to date has focused almost exclusively on improving the psychometric qualities of rating instruments and has neglected important organizational characteristics such as the relationships existing within manager-subordinate dyads. With the exception of research on the vertical dyad linkage (VDL) (Liden & Graen, 1980), actual and perceptual similarities (Pulakos & Wexley, 1983), and accurate perceptions (Wexley et al., 1980), the manager-subordinate relationship has been a neglected area of performance appraisal research. Obviously, continued research studies like the present one are needed.

Second, according to social learning theory, most human behavior is learned observationally through modeling others' behavior (Bandura, 1977). Observational learning is particularly relevant in behavior modeling and on-the-job training programs (Latham & Saari, 1979; Wexley & Latham, 1981). It is reasonable to postulate that the quality of the trainer-trainee dyadic relationship as measured by SPC as well as VDL could be an important factor in determining learning effectiveness on the part of trainees.

Finally, the concept of SPC might be relevant to the area of leadership as well. Because SPC is one index of the quality of the dyadic relationship, it seems logical to hypothesize that "effective" managers (as evaluated by their superiors) would be expected to have higher mean SPC within their work units than would less effective managers. This notion fits in with earlier research showing that managers who are high achievers promote mutual trust by being open and candid with their subordinates (Donnell & Hall, 1980). One also may hypothesize that more effective managers would have less SPC variance across dyads within their work units compared to less effective managers. That is, the more effective leader tries to treat his or her subordinates in an evenhanded manner (Feinberg, 1965). Studies currently are underway to investigate these and other SPC generated hypotheses.

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The Effects of Time Delay in Rating and Amount of Information Observed on Performance Rating Accuracy[1]

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A fundamental assumption underlying the performance appraisal process (that raters can make accurate ratings based on a limited number of observations from previous time periods) was tested in a laboratory experiment. The results suggest that ratings are less accurate when the rating is delayed and when a small amount of information is observed.

Increased attention recently has been given to the accuracy of performance ratings (Bernardin & Pence, 1980; Borman, 1977) because of the heavy reliance placed on them by those making personnel decisions regarding pay, promotions, and layoffs (Latham & Wexley, 1981). In particular, the primary focus has been on increasing the accuracy of these ratings through training programs (Bernardin & Pence, 1980; Borman, 1979; Latham, Wexley, & Pursell, 1975) and rating formats (Blanz & Ghiselli, 1972; Latham & Wexley, 1977; Smith & Kendall, 1963) designed to minimize common rating errors such as halo and leniency. Although there have been advances in these areas, little research has been conducted on the cognitive processes involved in performance rating and the variables influencing these processes. Without a better understanding of these issues, further gains in rating accuracy may be difficult to achieve (Feldman, 1981; Landy & Farr, 1980). In response to this situation, two variables that may influence the cognitive processing of performance information—the amount of information observed and the time delay in rating—were examined to assess their effects on performance rating accuracy.

In many organizations, it is not uncommon for performance ratings to be obtained in a situation in which the rater has a limited opportunity to

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observe the behaviors of the ratee and in which ratings are conducted on an annual basis (Feldman, 1981). Raters may observe a small number of behaviors as a result of their large span of control, physical distance from the ratee, and a large number of responsibilities not requiring interaction with the ratee. In addition, organizational policy may require that performance ratings be conducted once a year. The implicit assumption underlying this common situation is that raters can make accurate judgments about performance based on a limited number of observations from previous time periods. Considering the cognitive processes involved in the performance rating process, the validity of this assumption seems to be questionable.

According to Feldman (1981), the cognitive processes associated with performance rating are a special case of more general cognitive processes. The following cognitive tasks take place in sequential order as rating judgments are formed. First, behaviors of the ratee are recognized and attended to by the rater. Second, these behaviors are organized and then integrated with previously collected observations and placed into storage for retrieval at a later time. Finally, when the rating is to be made, this information must be recalled in an organized fashion and integrated into a summary judgment.

Time plays a critical role in this set of tasks (Feldman, 1981). The trace formed during the observation of performance decays rapidly as the time between observation and retrieval increases (Morris, 1978). Moreover, nonperformance related events may interfere with the trace during this time period (Briggs, 1957; Underwood, 1957). Finally, the memory system can process only n bytes of information, and when $n+1$ bytes are entered one byte becomes displaced (Waugh & Norman, 1965). With the passage of time, the number of bytes to be processed increases and, consequently, observations from previous time periods are less accurately recalled. In summary, the inability to recall, accurately, observations from previous time periods is a function of the passage of time, the interfering events between observation and retrieval, and the amount of information that can be processed without displacement. Consequently, performance ratings should be less accurate the longer the delay between observation and recall.

The amount of information observed in the first stage of Feldman's (1981) model also may impact on the ability to make accurate ratings. More specifically, the amount of information may exert an influence on the manner in which these observations are integrated with previously stored information. A summary of this process is found in Rush, Phillips, and Lord (1981) and Rush, Thomas, and Lord (1977). These researchers pointed out that individual observations are not separately processed in the storage and recall phases. Instead, they are grouped together prior to storage and then are attached to constellations of similar observations previously stored in memory (Brown, 1975; Tedeschi & Lindskold, 1976). On recall, these global categories are recalled rather than the individual or grouped-together observations (Feldman, 1981; Paris & Lindauer, 1977; Wyer & Scull, 1980). Logically, it is less likely that a small rather than large amount of observations will be integrated prior to and at the time of storage. Consequently, when small amounts of information are observed by the rater, the ratings will be less accurate.

The aforementioned literature suggests that performance rating accuracy is likely to be lower when delayed rather than immediate ratings are made, or when a small rather than a large number of behaviors are observed. Therefore, it was hypothesized that:

1. Ratings will be more accurate when ratings are completed immediately following observation rather than when they are completed at a later time.

2. Ratings will be more accurate the greater the amount of information observed.

Method

Experimental Design

A 2×3 factorial design with repeated measures was used. The first factor, time of rating (*T*), consisted of two levels: immediate and delayed ratings. The second factor, amount of information observed (*O*), had three levels: observation of 100 percent of the videotape (O_{100}), observation of 60 percent of the videotape (O_{60}), and observation of 20 percent of the videotape (O_{20}). The third factor, videotape (*V*), had three levels: videotape one, two, and three.

Videotape Development

A manufacturing exercise (Wexley & Jaffee, 1970; Wexley & Nemeroff, 1975) was videotaped. This 55-minute exercise required a supervisor and two subordinates to organize their business so as to maximize their profit. The work team purchased parts from a supplier, assembled the finished products (i.e., shipping containers) according to specifications, and sold them to a purchaser. During the exercise, the cost of parts and the prices of the finished products varied from one time period to another, thereby changing the margin of profit.

The exercise was conducted and videotaped three times. Each time the same supervisor and two different subordinates were used. A male manager from a small manufacturing company played the role of the supervisor, and male graduate students served as subordinates. Two weeks in advance of the videotaping, these actors were provided with instructions for the exercise. In addition, the graduate students were given a list of two behaviors to be exhibited at any time they felt it was appropriate during the exercise. The supervisor was given a list of 15 behaviors that could be used during the exercise and was told to use these or any other behaviors that fit his own style of supervision. He also was told to distribute his behavior evenly over time during each videotape. No other special instructions were provided to any of the actors, except that they were encouraged to act as they normally would. Immediately before the taping of each session the instructions to the exercise were reviewed and the actors practiced their assigned behaviors. These three videotapes were used for the O_{100} level of factor O.

The videotapes used in the O_{60} and O_{20} levels were developed from the O_{100} videotapes using the following procedures. First, three graduate students in organizational behavior, not involved in the videotaping of the exercise, reviewed each of the three O_{100} videotapes and recorded those critical incidents exhibited by the supervisor (Flanagan, 1954). Before making these judgments, the three raters were trained in this process. The definition of a critical incident was reviewed, examples were provided, and practice and feedback in making these judgments were given. The instructions to the manufacturing exercise also were reviewed, as were the job duties of the supervisor to be observed. The end product was a list of critical incidents for each rater on the performance of the supervisor in each of the three tapes. The order of the critical incidents was also known as the raters kept track of the time that each one occurred. The critical incidents were operationalized as all those incidents that at least two of the three raters agreed occurred at the same time. There were 18 critical incidents on the first tape, 11 on the second tape, and 13 on the third tape meeting these criteria. Each critical incident took, on the average, 90 seconds.

Next, three new tapes were developed for the O_{60} condition and three new tapes were developed for the O_{20} condition by sampling from the critical incidents and noncritical incidents on the O_{100} videotapes. The procedure was identical for all six videotapes and can be illustrated by examining the construction of the first videotape for the O_{60} condition. Of the critical incidents in the first videotape for the O_{100} level, 60 percent were randomly selected and placed into the first videotape for the O_{60} level. That is, the first O_{60} videotape had $11(.60 \times 18)$ of the critical incidents shown in the first O_{100} videotape. Each occurrence of a critical incident within the O_{100} videotape was treated as an element in the population (O_{100} videotape) to be sampled for the O_{60} videotape.

The rest of the first O_{60} videotape was made up of a random sample of 90-second segments from the first O_{100} videotape that were not treated as critical incidents. Thus, the first O_{60} videotape had $22[(.6 \times 55 \text{ minutes}) \div 90 \text{ seconds}]$ segments of videotape in addition to the 11 critical incidents. These noncritical incident segments and critical incidents were spliced together in the same order as the first O_{100} videotape. This procedure was repeated for the second and third O_{60} videotapes using the second and third O_{100} videotapes. This procedure was repeated for all three O_{20} videotapes, but here 20 percent rather than 60 percent of the critical incidents and segments were randomly selected from the O_{100} videotapes.

Measures

A behavioral observation rating form was developed and used by the subjects in all six conditions. The form consisted of 21 items describing all possible critical incidents that could be observed on the videotapes. Each item had a rating scale ranging from 0 to 4 representing the number of times the respondent observed the occurrence of that critical incident on the part of the supervisor.

True or correct scores were determined for each item in each tape by taking the number of times all three raters agreed that the critical incident had occurred. In the case in which a particular critical incident was not observed by all three raters, it was given a true score value of 0. The true score varied among the three levels of the O factor, but did not vary between the two levels of T for any one level of O. Within each of the six conditions, the true score varied among the three videotapes used in a particular condition.

Rating accuracy was calculated using a measure similar to the one previously used by Bernardin and Pence (1980). The scoring formula used in the present study is presented in equation 1.

$$\{\sum_{n=1}^{N}[(\sum_{a=1}^{A} D)/A]\}/N \tag{1}$$

where: N = number of items for each videotape (21).
A = number of videotapes and number of times each item was rated.
D = absolute distance of the observed score from the true score (0 to 4).

Subjects

The subjects were 180 undergraduate business majors in an upper level personnel management course at Michigan State University. Participation in this experiment was voluntary and subjects received points toward their final grade for completion of the entire experiment. There were 72 males and 108 females who participated in the project.

Procedure

Subjects were randomly assigned to one of the six conditions. Two weeks before the videotapes were shown, subjects were provided with instructions to the manufacturing exercise and were given a copy and explanation of the rating form. Questions about the manufacturing exercise were answered, as well as questions about the wording of the items on the rating form.

The videotapes were shown to the subjects on three consecutive Mondays. The three videotapes were presented in counterbalanced order within each condition to eliminate any possible confounding of the order in which the tapes were presented with the treatment conditions. In each condition, subjects watched each videotape one time. Subjects in the O_{100} level watched the O_{100} tapes, those in the O_{60} level watched the O_{60} tapes, and

O_{20} subjects watched the O_{20} tapes. In the immediate rating level, subjects rated the supervisor's performance immediately following the viewing of each videotape. In the delayed rating level, subjects rated the supervisor's performance one week after watching the third tape. At that time they completed the rating form three times, once for each videotape observed.

At the start of each rating session, the manufacturing exercise again was reviewed with the subjects, and they were instructed to pay careful attention to the behaviors of the supervisor. They also were instructed not to take notes during or after the session. After the experiment was completed and the results were analyzed, the subjects were fully debriefed.

Analysis

The hypotheses were tested using a two-way analysis of variance (ANOVA) with repeated measures. Because cell sample sizes were not equal or proportional to one another, the means were not weighted by sample size (Keppel, 1973). When the F test was significant for a main effect, planned comparisons were used to identify significant differences between means (Keppel, 1973). Statistical significance was assessed for the planned comparisons using the t statistic (Hays, 1973), and effect sizes were determined using omega-squared, ω^2 (Hays, 1963).

Results

Rating accuracy means and standard deviations for each experimental condition are presented in Table 1. There were no significant differences between male and female subjects' rating accuracy scores [$t(178) = .19$, *n.s.*].

The results shown in Table 2 support Hypothesis 1, which stated that immediate ratings would be more accurate than delayed ratings. The main effect for factor T was significant [$F(1, 174) = 4.48, p < .05$] and accounted for 2 percent ($\omega^2 = .02$) of the variance in rating accuracy. Planned comparisons revealed no significant mean differences in rating accuracy

Table 1
Rating Accuracy Means and Standard Deviations by Experimental Condition

Condition[a]	*n*	$\overline{X}^b$	*SD*
Immediate rating			
O_{100}	36	1.66	.34
O_{60}	22	1.75	.34
O_{20}	35	1.83	.47
Delayed rating			
O_{100}	21	1.81	.39
O_{60}	31	1.76	.38
O_{20}	35	2.10	.49

[a] O_{100} = observed 100% of tape; O_{60} = observed 60% of tape; O_{20} = observed 20% of tape.
[b] Scores can vary from 0 = most accurate to 4 = least accurate.

Table 2
Analysis of Variance Summary Table

Source	*df*	*MS*	*F*
Between subjects			
Amount observed (*O*)	2	.90	5.39**
Time of rating (*T*)	1	.75	4.48*
$O \times T$	2	.19	1.12
Subjects within groups	174	.17	
Within subjects			
Videotapes (*V*)	2	.01	1.15
$V \times O$	4	.01	1.99
$V \times T$	2	.002	.30
$V \times T \times O$	4	.02	2.45*
$V \times$ subjects within groups	348	.007	

*$p < .05$
**$p < .01$

between the immediate and delayed means for any of the three levels of factor *O*.

The results presented in Table 2 also support the second hypothesis, which predicted that ratings would be more accurate the greater the amount of information observed. The main effect for factor *O* was significant [$F(2, 174) = 5.39$, $p < .01$] and accounted for 5 percent ($\omega^2 = .05$) of the rating accuracy variance. When planned comparisons were conducted, there was a significant difference between the O_{100} and O_{20} means [$t(84) = -2.06$, $p < .05$] and between the O_{60} and O_{20} means [$t(84) = -2.85$, $p < .01$], in the predicted direction within the delayed level of factor *T*. No significant differences between means were found within the immediate level of factor *T*.

No significant interaction was found between factors *O* and *T* [$F(2, 174) = 1.12$, *n.s.*]. The main effect for factor *V* was not significant [$F(2, 348) = 1.15$, *n.s.*] and the only significant interaction with *V* was $V \times T \times O$ [$F(4, 348) = 2.45$, $p < .05$].

Discussion

The results support the hypothesis that immediate ratings result in more accurate ratings than do delayed ratings. Although the size of this effect was small, it may be more pronounced in an organizational setting in which ratings are made six months or one year after observation, rather than a maximum delay period of three weeks between observation of the first videotape and the rating, as in the present study. Confirmation of the first hypothesis suggests that raters should be encouraged to make their ratings as soon as possible following observation. A maximum delay period of three weeks in the present analysis led to a statistically significant decrease in accuracy. This finding is consistent with Rush et al. (1981), who found that the number of correct responses to a stimulus-recall measure, based on observations of a 15-minute videotape, significantly declined after a 48-hour delay between observation and recall. A precise numerical definition of how soon ratings should be made cannot be offered at this time, but the present results point to the futility of the common practice of having supervisors make ratings up to one year after observation.

The results confirmed expectations of the second hypothesis, that the accuracy of ratings would increase as the amount of information observed increased. Planned comparisons revealed that the source of this significant main effect was located in the delayed condition. In particular, raters in both the O_{100} and O_{60} delayed conditions were significantly more accurate than were raters in the O_{20} delayed condition. It appears that there may have been too few behaviors observed in the O_{20} condition to be grouped into a meaningful composite for storage and retrieval at a later time. However, in the immediate rating condition, the planned comparisons produced no significant differences between means for levels of factor O. It may have been the case here that a meaningful grouping of observations for storage and recall was possible regardless of the amount observed because there was no interference with these processes, given the immediacy of the rating.

In summary, support for the first hypothesis offers, in a sense, hope for those raters unable to observe a large number of the ratee's behaviors. That is, the loss of accuracy resulting from limited obervation may be regained partially by rating performance immediately following observation. Keeping a diary of critical incidents (Bernardin & Walter, 1977; Guion, 1965) might be helpful. Conversely, those organizations continuing to use delayed ratings based on a limited number of observations probably can expect a resultant decline in accuracy.

These conclusions and the data should be interpreted with caution. There are several potential limitations to the study. First, the results may have been due to the demand characteristics of the situation. Efforts were taken, however, not to reveal the purpose of the experiment to the subjects, and the experimenter had no direct contact with the subjects except for the reading of instructions before showing each videotape. Second, the results may have been due to a diffusion of information by subjects between conditions. Anecdotal evidence suggests, however, that subjects strictly adhered to instructions not to converse with other subjects about the experiment. Third, the results of the repeated measures analysis revealed that there was a significant $V \times T \times O$ interaction. However, three videotapes were shown to subjects rather than one, so as to maximize the realistic nature of the laboratory rating process.

Caution also must be exercised in generalizing from the present set of results, generated in the laboratory, to organizational settings. Characteristics associated with the rating task, subjects, and manipulations circumscribe this experiment. First, the performance being viewed was of short duration, and subjects were asked to recall the frequency of exhibited behaviors. This is unlike most organizational contexts, in which behavior is observed for a long period of time and then a global, summary judgment is made from these observations. Second, the observations were made from videotaped rather than live persons. However, this constraint may not be severe. Research reviewed by Lifson (1953) has suggested that filmed performances are rated the same as live performances. Third, the raters were able to devote their entire attention to the videotapes, a situation unlike that of a busy manager with many other responsibilities. Fourth, the time of rating manipulation was for only a maximum of three weeks. In most organizations the delay between observation and recall may be up to one year. Finally, business students and not managers were used as raters, and the results can be only tentatively generalized to a managing population. However, employment decisions made by students in laboratory settings have been found to be similar to those made by professional managers (Schmitt, 1976). These limitations may be responsible for the small amounts of rating accuracy variance accounted for in this study.

This experiment needs to be replicated and extended in a field setting using different subjects, rating formats, delay periods in rating, and amounts and type of information observed. The study also needs to be extended by holding either time or the number of observations constant in the *O* factor in order to determine which of the variables has more effect on accuracy. The present study allowed both time and number of observations to vary in the *O* condition. This was done because in most work situations the more behaviors observed, the greater the length of time needed for observation.

In summary, the results of this experiment suggest that future research might be directed toward further assessing the impact on performance rating accuracy attributable to: (1) time delay in rating and (2) the amount of information observed.

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High Profit Strategies in Mature Capital Goods Industries: A Contingency Approach[1]

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High profit and low profit strategic "gestalts" in two different types of mature capital goods industries are examined. Multiple avenues to high profits are found within both types, but they differ between the two types in ways that can be reconciled with industry characteristics. Cluster analysis emerges as a promising technique for strategy research.

An earlier paper presented a taxonomy of mature industrial-product environments derived from the PIMS data base (Hambrick, 1983). One of the reasons for deriving the typology was to allow eventual development of a "medium-grain" contingency model of business-level strategies, or pursuit of the question, "How is high performance achieved in each environment?" The present paper is an attempt to address the performance question for two of the eight environmental types: disciplined capital goods makers and aggressive makers of complex capital goods. The limited scope of the paper stems from the need to devote attention to presenting the methodology in detail.

The type of environment labelled "disciplined capital goods makers" has three distinguishing characteristics: an infrequently purchased product, above average export levels, and stable market shares. Examples of such industries are railway equipment, power transmission equipment, foundry equipment, and turbines. These are high value-added products that can compete well internationally. However, they are not esoteric or necessarily dynamic. Hence, norms have evolved such that members' roles within the industry are well understood and there is little boat-rocking. As reported

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in Hambrick (1983), 107 Profit Impact of Marketing Strategies (PIMS) businesses have been identified that operate in this type of environment.

The environment "aggressive makers of complex capital goods" shares two characteristics with the environment discussed above: a very infrequently purchased product and above average export levels. But this environment has several characteristics that sharply distinguish it from the other: high product dynamism (new product sales and rate of technological change); product sophistication (need for follow-up service and major role of professionals in the purchase decision); high vulnerability (high imports and low value added per employee); and very unstable market shares. These are capital goods industries whose product is complex—possibly with many moving parts, requiring highly skilled operators, and/or of key importance to the customers' productivity. There probably is ongoing upgrading of the efficiency, flexibility, and serviceability of these products. Major breakthroughs on any of these fronts can occur relatively frequently; hence market shares are volatile. Certain parts of the construction machinery, textile machinery, printing machinery, and paper machinery industries might well be represented among the 57 such businesses identified in the PIMS data base.

A combination of two factors makes these two environments ideal for highlighting the usefulness of the taxonomic scheme. First, on the surface they appear to be very similar types of enviroments. Without the empirically-derived taxonomy, both types of businesses could be pooled naively in a study of mature capital goods. Second, as will be seen, the patterns associated with high profitability are quite different across the two types of environments.

Strategy: Concepts and Typologies

One can view strategy as an artful alignment of environment, resources, and values (Andrews, 1971). This view, which dominated the strategy literature until recently, is a bit discouraging to theory builders because it allows for no generalizations. Another view is that there are a limited number of strategic archetypes that capture the essence of most business units' competitive postures. This typological view favors theory building and systematic exploration, although typologies run the risk of oversimplifying. Porter's (1980) typology of generic strategies seems especially useful, because (1) it builds on previous findings and (2) it is appropriately broad, but not vague.

According to Porter, there are three generic strategies that might lead to success for a business (Figure 1). "Cost leadership" was promoted through the 1970's by the literature on experience (Henderson, 1979) and market share (Buzzell, Gale, & Sultan, 1975). Cost leaders, often market share leaders, pay great attention to asset use, employee productivity, and discretionary expenses. Their customers buy their products primarily because they cost less than competitors' equivalent products.

Figure 1
Porter's Typology of Generic Strategies

		Strategic Advantage	
		Uniqueness perceived by the customer	Lowest cost position
Strategic Target	Industry wide	DIFFERENTIATION	COST LEADERSHIP
	Particular segment only	FOCUS	

"Differentiation" involves creating value that is perceived as unique. It can take many forms, including brand image, service, distribution, quality, and product attributes. This strategy does not allow a business to ignore costs, but costs are not a key ingredient.

"Focus" involves competing in a narrow segment that can be based on buyer type, product type, geography, or other factors. A focused business usually needs to choose between cost leadership and differentiation. But, as Porter notes, the possibility of combining the two approaches is fairly good, because the business is already dedicated in its endeavors.

Underlying any typology are its classifying dimensions. Porter portrays his typology two-dimensionally, but it would seem that each type really represents a theorized confluence on three dimensions, which can be defined as follows:

Efficiency:	the degree to which inputs per unit of output are low
Differentiation:	the degree to which the product and its enhancements are perceived as unique
Scale/scope:	the relative size and range of activities of the business within its industry

It may be true, as Porter argues, that efficiency and differentiation are generally incompatible, but they are not opposite ends of a single continuum. As Hall (1980) noted, some competitors can excel at both (e.g., Toyota and Caterpillar). At a more academic level, some attributes of a business may indicate a value for one of the dimensions without indicating anything about the other two. For example, employee productivity says something about the efficiency of the business without saying anything about its differentiation or scale/scope. Thus, the three dimensions are taken to be conceptually distinct, even if correlated. It also is argued that one of these dimensions—efficiency—should be subdivided into two categories that would allow far more precision in assessing strategies:

Cost efficiency:	the degree to which costs per unit of output are low
Asset parsimony:	the degree to which assets per unit of output are few

Of course, these overlap to the extent that depreciation comprises overall costs. But the distinction is needed and useful because (1) capital intensity has been shown to be a crucial strategic option (Gale, 1980); (2) capital intensity often is presumed to vary inversely with direct costs (Porter, 1980); and (3) return on assets, not just sheer profits, is the presumed aim of most businesses. The supposition is that cost efficiency and asset parsimony may have differing impacts across industry types.

Some mention should be made as to how Porter's typology fits with that of Miles and Snow (1978), also prominent in recent literature. Their typology has a single underlying dimension: the business's willingness to alter its products and markets. A "prospector" who innovates early in the face of product/market opportunities is pursuing a particular type of differentiation strategy. A "defender" who maintains a stable offering may choose to exploit its stability in the form of low costs (cost leadership), product quality (another form of differentiation), or some combination of competitive weapons. The two typologies are not incompatible; rather, their juxtaposition indicates the complex webs of strategic options available to a business and the difficulty in trying to classify such options concisely. Fortunately, both Porter (1980) and Miles and Snow (1978) acknowledged the complexity of the phenomena they were attempting to categorize, giving rise to several points of importance to this study.

First, there are many variations of each strategic archetype. To some extent, the nature of the industry will affect the array of configurations each strategy can take. Among community hospitals, geography would not be a primary way of thinking about "scale/scope." Range of services would be, however. Among commodity-like industries, product quality would not be a common differentiating dimension, but delivery would.

Second, the strategic archetypes do not appear with equal frequency in all industries. Because of industry norms or product/market attributes, some strategies are more common than others in each industry (Lawrence, 1981; Porter, 1980; Snow & Hambrick, 1980). For instance, one might expect to find many firms in the home computer industry pursuing differentiation strategies but few pursuing cost leadership strategies. This pattern could change as the industry matures, and it would be the reverse for, say, the commodity-like abrasives industry.

A related third point is that market share leaders—who in essence are in a position to "pick" their strategy—differ across industries as to which strategy they tend to pursue. If the industry somehow favors a differentiation strategy, that is what the market leaders will tend to pursue: namely, share leadership may allow cost leadership, but does not necessitate it. In some instances, the market leader can most profitably exploit its dominance through a differentiation strategy.

This suggests a fourth point: the various strategies—all legitimate, according to Porter and Miles and Snow—do not lead to equal success within an industry. As Hambrick (1983) found in his study of defenders and prospectors, some are more successful than others, depending on the type of environment.

On the negative side, each type of industry has its own common variations of the "stuck in the middle" (Porter, 1980) or "reactor" (Miles & Snow, 1978) strategies that result in low performance. In some cases, these low performance strategies reflect a fundamental mismatch between the business and the demands of the environment. In other instances, the low performance businesses attempt to mimic the industry's successful strategies but fall short in some important, common ways.

The above points suggest a union of two key views in the field of strategic management: (1) A limited number of strategic archetypes exist and can be found in most industries (Miles & Snow, 1978; Porter, 1980); but (2) each industry has its own environmental requirements or key success factors (Hambrick, 1981; Lawrence & Lorsch, 1967). It would seem possible to contribute toward a contingency model of strategy by looking at strategic types across different kinds of industries (Hofer, 1975).

Propositions

The above discussion suggests some propositions, which this paper seeks to explore:

1. *The primary strategies pursued by high-performers among the two industry settings will closely resemble Porter's three strategic types—cost leadership, differentiation, and focus.* Here, Porter's typology is set up as a straw man. The object is to determine whether it in fact encompasses the array of high profit configurations found among these types of industries.

2. *Even though all three of Porter's strategic types may be found among the two industry settings, not all three of Porter's types will be found within each industry setting.* In particular, it is expected that the product dynamism and share volatility faced by the aggressive makers of complex capital goods (ACs) rule out cost leadership as a primary strategic option.

3. *Even when found in both settings, a generic strategy will tend to have a different configuration in each setting.* Any such differences can be traced to the different industry characteristics. In particular, it is expected that the product dynamism and product sophistication inherent in the AC setting will make product innovation and close relationships with users prominent among any differentiation strategies pursued by high performance ACs. Within the disciplined capital goods makers (DM) setting, differentiation strategies also will be found, but they will tend to hinge on perceived product quality (reliability/durability) and image.

4. *Market share leaders in the two industry types will differ in their strategic tendencies.* It is expected that share leaders in the orderly DM setting will tend toward cost leadership strategies; whereas, among the more dynamic and complex ACs, share leaders will tend toward differentiation strategies.

5. The primary strategies pursued by high performers in an industry type will differ from the primary strategies pursued by low performers. No specific propositions are available, but it is important to confirm generally that the high profit strategies in fact differ from what is found elsewhere in the industry setting.

Methodology

Sample

This study used the PIMS data base, which has been described and critiqued elsewhere (Anderson & Paine, 1978; Hambrick, MacMillan, & Day, 1982; Schoeffler, 1977). More specifically, data on two types of mature industrial-product industries were examined. These two types—disciplined capital goods makers ($n = 107$) and aggressive makers of complex capital goods ($n = 57$)—were among the eight types of industries identified through cluster analysis and discussed in Hambrick (1983).

Strategic Attributes

The process for separating the PIMS variables into environmental and nonenvironmental was presented in Hambrick (1983). This involved a mail panel of 15 people who have strong familiarity with the PIMS program and strategy formulation. Nonenvironmental variables were subdivided (also with the aid of the panel) into "strategic position" variables (those attributes that are difficult to change in the short term, e.g., market share) and "strategic choice" variables (those attributes that can be more readily changed in the short term, e.g., advertising expenditures).

A total of 22 position variables and 35 choice variables were identified. Several were determined to have weak scales or very restricted distribution of responses, and these items were dropped, leaving 18 position variables and 23 choice variables. Four-year averages were used.

A number of intercorrelations existed within the position and choice variable sets, thus indicating underlying structures. The two sets were separately factor analyzed ($n = 400$, a random sample of mature industrial-product businesses). Several factoring approaches closely mirrored the results obtained through varimax rotation and orthogonal factoring, the approach that was settled on. This analysis suggested that 6 "position" and 11 "choice" attributes existed in the data. These are presented in Table 1, along with the factor loadings of member variables.

Table 1 also indicates how the various attributes might be reconciled with the four conceptual dimensions discussed earlier—cost efficiency, asset parsimony, differentiation, and scale/scope. For example, product innovation is primarily an indicator of differentiation. For some attributes, the associations with the dimensions are not singular. Hence, the attempted classification is not definitive; rather, it is presented to aid the reader's interpretation of the various attributes.

The scores of all underlying variables were standardized as z values (mean = 0; s.d. = 1). Multi-item dimensions were constructed by weighting the member variables by their factor coefficients.

The original plan was to develop a three-tier typology: environments, positions within environments, and strategic choices within those positions. This was the rationale for separating the position and choice variables. It quickly became clear that the available sample size would not allow the three-tier concept to develop meaningfully. The development of the two sets of strategic dimensions has been reported so that the reader can be alert to their existence and interpret the results in their light. However, all subsequent analyses treat the 17 strategic dimensions as a single set.

Performance

Return on investment (ROI) (four-year average) was used as the performance measure of this study, calculated as pretax profits divided by net investment. This measure suffers the limitations of any accounting

Table 1
Strategic Attributes Included in the Study

Name and Member Variables (factor loadings in parentheses)	*Primary Associations with Four Broad Dimensions of Strategy*
Strategic Position Attributes	
1. Market share market share relative to three leading competitors (.99) market share relative to leading competitors (.82) market rank (–.71) capacity/market size (.75)	Market share primarily indicates the *scale/scope* of the business
2. Capital intensity gross book value of plant and equipment/revenues (.76) net book value of plant and equipment/revenues (.93) total net investment/revenues (.98)	Capital intensity indicates the (lack of) *asset parsimony* of the business
3. Affinity with users channels' gross margins (–.71) percent revenue direct to end users (.83) customization (.38)	Affinity with users primarily indicates a capability for, or tendency toward, *differentiation*
4. Number of customers number of immediate customers (.76) number of end users (.63) fragmentation of sales to immediate customers (.31)	Number of customers indicates the *scale/scope* of the business
5. Technological protection product patents (.65) process patents (.71)	Technological protection primarily indicates the *differentiation* of the business, less so its cost efficiency
6. Freshness plant and equipment newness (.41) percent employees unionized (–.40)	Freshness primarily indicates (lack of) *asset parsimony* because it reflects newness of assets; the unionization component could indicate cost efficiency

Table 1 (continued)

Name and Member Variables (factor loadings in parentheses)	*Primary Associations with Four Broad Dimensions of Strategy*
Strategic Choice Attributes	
1. Value added value added/revenues (.95) purchases/revenues (-.94)	Value added primarily indicates *scale/scope* because it reflects the number of steps performed in the vertical chain; could also indicate differentiation via adding unique value
2. Quality relative product quality (.68) relative service (.61) relative image (.77)	Quality indicates *differentiation*
3. Current assets inventory/revenues (.62) receivables/revenues (.56)	Current assets indicates (lack of) *asset parsimony*
4. Product innovation product R&D/revenues (.40) percent sales from new products (.71) relative percent sales from new products (.61)	Product innovation indicates *differentiation*
5. Domain breadth relative breadth of product line (.66) relative breadth of customer types (.60)	Domain breadth indicates *scale/scope*
6. Relative costs and prices relative direct costs (.64) relative compensation levels (.31) realtive prices (.58)	Relative costs and prices indicates *cost efficiency*
7. Relative marketing expenditures relative promotion expenditures (.52) relative sales force expenditures (.52)	Relative marketing expenditures primarily indicates *differentiation* and less so cost efficiency
8. Marketing expenditures sales force expense/revenues (.66) promotion expenses/revenues (.31)	Marketing expenditures primarily indicates *differentiation*, less so cost efficiency
9. Relative vertical integration relative forward integration (.39) relative backward integration (.36)	Relative vertical integration indicates *scale/scope* (array of steps performed in the value/added chain)
10. Capacity utilization percent capacity utilized (did not load with other variables)	Capacity utilization indicates degree of *asset parsimony*
11. Employee productivity value added per employee (did not load with other variables)	Employee productivity primarily indicates *cost efficiency*

measure—varying depreciation methods, inventory valuations, and so on, and it does not necessarily reflect the fitness of the business for the future. Still, it closely resembles the primary objective most firms expect of their mature units—profits and/or cash flow. ROI was chosen over cash flow to allow comparisons with other PIMS findings that have dealt almost exclusively with ROI. Both were not included because they are highly correlated and yield generally redundant results for mature businesses (MacMillan, Hambrick, & Day, 1982).

Data Analysis

Two types of analysis were conducted on each of the industry types. Multiple regression was conducted, in which the strategic attributes were regressed against ROI. Such an analysis reveals the independent effects of each strategic attribute on ROI, but it does not reveal insight as to which combinations of attributes, or strategies, are prominent among high performers in each setting.

More central to the theme of this project was the use of cluster analysis, which allows an exploration of recurring combinations of strategic attributes among high performers in each industry type. Cluster analysis has been used in very few strategy studies (Woo & Cooper, 1981), even though it is well suited for exploring interdependent patterns within businesses.

Clusters of high performing (pretax ROI > 25 percent) and low performing (pretax ROI < 15 percent) businesses were established. (These ROI cutpoints divide all PIMS mature industrial-product businesses into equal thirds. Mean ROI for all such businesses is 22 percent.) The specific technique used was minimum squared-error clustering of euclidean distances. See Hambrick (1983) for a discussion of the logic and mechanics of cluster analysis as applied to PIMS data.

Results and Discussion

Before turning to the cluster results, it is useful to summarize briefly the regression results (detailed results may be obtained from the author). The regression models were moderately strong predictors of ROI, as indicated by R^2s of .49 for DMs and .66 for ACs (both significant at .01 level). But three of the strategic attributes most strongly associated with ROI in both samples—capital intensity, value added, and employee productivity—all have a direct mathematical link to ROI (value added and employee productivity include a profit component; capital intensity indicates net investment, which is the ROI denominator); so some unknown predictive portion of the models stems strictly from arithmetic. (See MacMillan et al., 1982, for detailed discussion of this problem.)

Because of the dominating common effects of these arithmetically related variables, the overall regressions were not significantly different as judged by the Chow test (Johnston, 1972). Therefore, it is not legitimate to belabor the differences in significance of the individual variables. When the regressions were run without the three confounding variables noted above, the overall regressions were significantly different, as judged by the Chow test, and almost all the initial indications of significance again were observed. In particular, among the DMs, affinity with users (negative), quality (positive), marketing expenses (negative), relative costs and prices (positive), and market share (positive) were related to ROI. Among the ACs, technological protection (positive), capacity utilization (positive), domain breadth (positive), and relative vertical integration (negative) were related to ROI.

It was not the primary intent of this project to hypothesize differences in the effects of individual variables on ROI across the two industry types. In fact, such an approach would have been at odds with the primary goal of seeking out gestalts or packages of strategic attributes associated with high performance in each industry type. As such, no further discussion of the regressions will be undertaken. They have been reviewed for the reader's information and also to signify the type of results available from a strictly econometric approach to the study.

High Profit Clusters

Regression indicates the independent effects of strategic attributes on ROI; but, without a complex web of interaction terms, regression does not reveal which *combinations* of attributes are particularly good or bad. For example, from the regression results noted above one could conclude that an AC will do well if it has these characteristics: patented innovations, high capacity utilization, a relatively broad domain, and low vertical integration. But, because regression quite literally identifies the isolated effects of each independent variable, nothing is known about whether it makes sense to pursue these characteristics in concert. It may be that this combination of attributes in a single business actually leads to very low performance or, more likely, that this combination simply is not very feasible.

High profit clusters reveal combinations of strategic attributes. Cluster analysis is not, strictly speaking, a statistical test, so the interpretation of clusters is impressionistic. As a way of controlling this problem, the interpretation here is guided by indications of significant differences derived from multiple t-tests to compare means in each cluster with means for all members of the industry type. This approach to characterizing "objectively" what is special about a cluster often is overlooked by researchers who use cluster analysis.

The researcher faces the choice as to the number of clusters to discuss. The results here lent little concrete guidance; for neither sample was there a discontinuity in average cluster tightness anywhere between a two- and five-cluster solution. Thus several criteria guided the choice of three clusters as appropriate for viewing high profit strategies in each of the two types of industries. First, the number of clusters that could be examined was limited by the sample sizes of high profit businesses ($n=40$ for DMs; $n=23$ for ACs). As it is, not all the clusters to be reported are of ideal size for strong generalization, but this condition worsens appreciably with more than three clusters per environment. Second, three high profit clusters per industry type (hence six), along with a discussion of low profit clusters, seemed an upper bound on what could be conveyed usefully in this exploratory paper. Third, the choice of three clusters allows direct comparison with Porter's typology of three strategies. The results in no way will prove or disprove the validity of the typology, but they will reveal those three strategic combinations that, as quantitatively determined, might be considered the *primary* ways of achieving high profits in each industry type.

Disciplined Capital Goods Makers. Table 2 presents the profiles of three high profit clusters among disciplined capital goods makers. The signs indicate strategic attributes with mean scores significantly different from the overall means for this type of industry.

Table 2
Profiles of Strategic Attributes for Disciplined Capital Goods Makers (DMs)— Entire Sample and Three High-Profit Clusters[a]

	Entire Sample (n=107)		*Cluster 1 (n=5)*		*Cluster 2 (n=16)*		*Cluster 3 (n=19)*	
Strategic Attributes	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Differentiation								
Affinity with users	.04	.74	.21	.58	−.33*	.75	.21	.68
Technological protection	−.03	.78	.04	.59	.45	1.07	−.22	.32
Quality	−.06	.85	−.36	.45	−.06	.82	.47*	1.03
Relative marketing	−.06	.55	.06	.53	−.15	.47	.20	.58
Marketing expenses	.08	.76	−.33	.72	−.05	.67	.17	.90
Product innovation	−.06	.53	−.42**	.08	−.03	.29	.06	.51
Asset parsimony								
Capital intensity	.08	1.00	.68**	.60	−.25*	.67	−.45**	.57
Current assets	.14	.94	−.62**	.57	.00	.76	−.29**	.53
Capacity utilization	.05	1.00	.49	.84	.87**	.51	−.60**	.82
Freshness	.05	.51	.26	.31	.00	.50	.03	.59
Cost efficiency								
Relative costs and prices	−.02	.60	−.60**	.36	−.18	.47	.02	.54
Employee productivity	.02	.99	2.77**	.52	.16	.67	−.05	.62
Scale/scope								
Market share	−.06	.90	−.19	.50	−.41**	.28	.86**	1.08
Number of customers	−.12	.95	−.68**	.59	−.08	1.06	.00	.76
Domain breadth	−.06	.71	−.19	.22	−.33	.61	.09	.81
Value added	.14	.99	−.18	1.01	.56*	.81	.41	.91
Relative vertical integration	.07	.43	.00	.19	−.08	.34	.15	.43
Cluster name:			Cost leadership		Asset-conscious followers		High-quality gendarme	

[a]Significance of difference from mean of entire DM sample: *$p<.05$; **$p<.01$.

Cluster 1 consists of five businesses. This strategy closely fits Porter's *cost leadership* archetype. Member businesses are very efficient, probably relying heavily on automation and managing inventories closely. They eschew product changes, preferring to serve a narrow steady domain. Hence, this also resembles Miles and Snow's (1978) defender strategy. This strategy appears to fit well in this environment because of the low level of product dynamism in the industry and a lack of aggressive share-fighting. It is noted that these businesses are price/cost leaders even though they are not share leaders.

Cluster 2 consists of 16 businesses that appear to be low share operators that carefully manage their asset base. They hold down their capital expenditures, making sure that capacity is fully used. This is a realistic strategy, given the stable market shares in this type of industry. These businesses appear to have no consistent differential advantage. They operate under stable price umbrellas and market share provinces. These businesses might be termed *asset-conscious followers.*

Cluster 3 consists of 19 businesses. This strategy, the most populous of the three examined, has several interesting facets. These are market share leaders who compete through quality rather than through price. Even though they might have the cumulative experience that would allow them to be cost leaders, they have opted for the higher margin route of competing on image and service. They appear to hold down their capital intensity, probably adding considerable value (or perceived value) through distribution, service, marketing, and other devices that require little capital. Even though their capital intensity is low, their unused capacity is high. This suggests their role as policemen in their industries. As Porter (1980) indicated, unused capacity can be a great barrier to mobility in an industry. A market leader can impose considerable discipline by carrying unused capacity, which it can tacitly threaten to bring into use—presumably to do battle against any upstart. This may be part of the cause behind the stable shares among DMs. This strategy, a ***high-quality gendarme***, is an interesting form of differentiation strategy.

Aggressive Makers of Complex Capital Goods. Table 3 presents the profiles of three high profit clusters among aggressive makers of complex capital goods. Cluster 1 consists of five businesses pursuing a ***broad-based differentiation*** strategy. The businesses are close to their customers, have proprietary technology and quality. These traits seem well suited to the complexity of AC products. A common trap for differentiated businesses is that they are poor asset managers, but businesses in Cluster 1 have avoided this trap. They hold down their capital intensity, manage their receivables

Table 3
Profiles of Strategic Attributes for Aggressive Makers of Complex Capital Goods (ACs)—Entire Sample and Three High-Profit Clusters[a]

	Entire Sample (n=57)		*Cluster 1 (n=5)*		*Cluster 2 (n=8)*		*Cluster 3 (n=10)*	
Strategic Attributes	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Differentiation								
Affinity with users	.34	.66	.72**	.11	.63**	.25	.40	.67
Technological protection	.00	.67	.66**	.75	.08	.52	.14	.79
Quality	.26	.98	1.14**	.29	.73**	.43	.48	.89
Relative marketing	-.03	.59	-.08	.73	.13	.16	-.18	.47
Marketing expenses	.16	.77	.25	1.01	.01	.88	.02	.35
Product innovation	.84	1.41	.36**	.43	3.06**	.55	.49**	.64
Asset parsimony								
Capital intensity	.20	1.25	-.61**	.45	-.53**	.46	-.56**	.46
Current assets	.51	1.12	-.25**	.55	-.19**	.38	-.13**	.29
Capacity utilization	-.29	1.04	.54**	.72	.21*	.72	-.27	1.17
Freshness	.28	.55	.35	.56	.49	.43	.07	.62
Cost efficiency								
Relative costs and prices	.25	.95	.35	.39	-.13	.81	.23	1.23
Employee productivity	-.22	.57	-.11	.46	-.27	.47	.07	.99
Scale/scope								
Market share	.61	1.38	3.29**	.30	.77	.89	.30	.85
Number of customers	-.28	.77	-.14	.44	-.18	.96	-.57	.75
Domain breadth	.12	.81	.73**	.27	.35	.69	-.44**	.50
Value added	.50	.87	.31	.86	1.14**	.55	.55	1.07
Relative vertical integration	.12	.45	.09	.23	.37**	.28	.03	.66
Cluster name:			Broad-based differentiation		Prospectors		Asset-conscious focusers	

[a] Significance of difference from mean of entire AC sample: *$p<.10$; **$p<.01$.

and inventories well, and strive to operate at full capacity. These businesses apply their many strengths in a broad array of market segments.

Cluster 2 consists of eight businesses that share several attributes with Cluster 1, but these businesses have very high product innovation and high value added. They are *prospectors* (Miles & Snow, 1978)—a form of differentiation strategy. They define the state of the art in their product categories, competing by stimulating and meeting new market needs. They do not have large market shares because they operate at the frontiers of their markets. Unlike most innovators, these businesses share with Cluster 1 the trait of being good asset managers. This is not to say that they are cost efficient, because costs and employee productivity are not notable. They are careful with their assets—presumably holding down automation, using flexible plant and equipment, and managing working capital carefully.

Cluster 3 consists of 10 businesses. These *asset-conscious focusers* do not have any consistent differentiation scheme. Rather, they appear to dedicate themselves to narrow segments that they serve in a variety of (unspecified) ways, while holding down assets and innovations. Of all the high profit clusters examined, this one indicates the least fitness for the future and may represent "harvest" missions for these businesses.

Low Profit Clusters

Low profit (ROI$<$15 percent) clusters also were examined in order to confirm that the high profit clusters actually were different from what might be found elsewhere in their industry types. Because relatively few low profit businesses populated the two industry types ($n=19$ for DMs; $n=12$ for ACs), only two low profit clusters are reported for each. Their characteristics are presented in Tables 4 and 5.

Disciplined Capital Goods Makers. Cluster 1 (Table 4) consists of seven businesses. They appear to differentiate by means of quality, but they are lacking in focus and cannot meet the industry's requirement for efficiency. Their capacity is fully utilized, maybe due to their broad customer base, but their costs are not competitive and their productivity is low. Perhaps these businesses could bring their costs more into line if they would narrow their focus. However, even then, they would not resemble any of the high profit DM clusters. These businesses are *inefficient through dispersion* and appear to be fundamentally mismatched with the requirements for the environment.

Cluster 2 consists of 12 businesses that have no apparent strengths. They may have been lulled into impotence by the orderly nature of their industries. These *passive anemics* do not resemble any of the high profit clusters. Any turnaround attempt would require major changes.

Aggressive Makers of Complex Capital Goods. Cluster 1 (Table 5) consists of seven businesses. Whereas all of the high profit AC clusters have low capital intensity (presumably in response to their dynamic environments), these businesses are very capital intensive and poor current asset

Table 4
Strategic Attributes of Two Low-Profit Clusters Among Disciplined Capital Goods Makers (DM)[a]

	Cluster 1 (n=7)		*Cluster 2 (n=12)*	
Strategic Attributes	*Mean*	*S.D.*	*Mean*	*S.D.*
Differentiation				
Affinity with users	-.15	.77	-.05	.74
Technological protection	.05	.57	.15	1.02
Quality	.56**	.59	-.63**	.58
Relative marketing	-.03	.56	-.35**	.41
Marketing expenses	-.18	.32	.05	.54
Product innovation	.09	.50	-.08	.33
Asset parsimony				
Capital intensity	.33	.81	.14	.77
Current assets	.47	.78	.01	1.37
Capacity utilization	.42**	.34	.13	.94
Freshness	.06	.32	-.12	.42
Cost efficiency				
Relative costs and prices	.50**	.43	.07	.40
Employee productivity	-.40**	.32	-.02	.78
Scale/scope				
Market share	-.10	1.38	-.68**	.12
Number of customers	.27*	.46	.02	.86
Domain breadth	.50**	.43	-.57**	.46
Value added	-.16	.84	-.63**	.58
Relative vertical integration	.32	.41	.07	.43
Cluster name:	Inefficient through dispersion		Passive anemics	

[a]Significance of difference from mean of entire DM sample: *$p<.05$; **$p<.01$.

managers. Moreover, they have no apparent differentiating device. These *overexposed, undercompetitive* businesses are at great odds with all of the high profit AC clusters.

Cluster 2, consisting of five businesses, somewhat resembles Cluster 1. But Cluster 2 differs from Cluster 1 in two ways: high costs and prices, and high quality. At least these businesses have a competitive foundation—quality. But they are producing at such high costs—a tendency in an industry in which stringent cost control is not particularly rewarded—that they simply are not competitive. When this weak cost position is combined with overcapitalization, poor ROI is the result. These *asset-heavy, value-light* businesses bear little resemblance to any of the three high profit AC clusters.

Synthesis and Conclusions

Several primary conclusions can be distilled from this study of high profit and low profit strategies in two different types of environments.

Contribution of Cluster Analysis

Cluster analysis—a little-used method in strategy studies—revealed information complementary to regression analysis. Whereas regressions

Table 5
Strategic Attributes of Two Low-Profit Clusters Among Aggressive Makers of Complex Capital Goods (AC)[a]

Strategic Attributes	*Cluster 1* *(n = 7)* *Mean*	*Cluster 1* *(n = 7)* *S.D.*	*Cluster 2* *(n = 5)* *Mean*	*Cluster 2* *(n = 5)* *S.D.*
Differentiation				
Affinity with users	–.07	.68	.20	.76
Technological protection	.20	.84	.00	.63
Quality	–.87**	.58	1.06**	.25
Relative marketing	–.21	.68	–.21	.47
Marketing expenses	.11	.72	–.02	.31
Product innovation	.05**	.69	.10**	.56
Asset parsimony				
Capital intensity	1.40**	1.26	1.33**	1.10
Current assets	1.70*	1.40	1.14**	.49
Capacity utilization	–.18	.36	–.14	.15
Freshness	.05	.46	.47	.36
Cost efficiency				
Relative costs and prices	.09	.62	1.63**	.65
Employee productivity	–.43	.37	–.32	.25
Scale/scope				
Market share	–.39**	.30	–.54**	.03
Number of customers	.07	.93	–.31	1.01
Domain breadth	–.49*	.74	–.65**	.47
Value added	.14*	.71	.49	.51
Relative vertical integration	–.03	.41	.09	.40
Cluster name:	Overexposed undercompetitive		Asset-heavy value-light	

[a]Significance of difference from mean of entire AC sample: *$p<.05$; **$p<.01$.

indicate the independent effects of attributes, clusters reveal interdependent "packages" of attributes associated with success. The two techniques can be expected to lead to somewhat different insights. For example, among ACs, the regression indicated no effect from market share. But one of the high profit clusters had high market share, and both of the low profit clusters had low shares. These should not be taken as contradictions. Rather, the two techniques rely on quite different manipulations of the data. Also, the regressions included data on medium profit businesses, which were not studied in the cluster analysis.

If one agrees that a strategy is a holistic set of attributes, then cluster analysis seems especially appropriate and promising for future strategy research. Researchers and executives must take care to distinguish between the supposed effects of a single variable and its effects when combined with certain configurations of other variables. The concept of internal consistency (Andrews, 1971; Miles & Snow, 1978; Tilles, 1963) argues that a functional move that seems to have merit when viewed alone, may lead to poor results because of a mismatch with other attributes of the business.

Support for Propositions

The cluster analysis generally supported the propositions set forth earlier. In accord with the first proposition, Porter's (1980) strategic types, or close variations of them, were well represented among the high profit clusters. One of the clusters is a "pure" *cost leadership* strategy. Three (*quality-based gendarme, broad-based differentiation*, and *prospector*) are differentiation strategies. One (*asset-conscious focusers*) has elements of a focus strategy. In addition, Miles and Snow's (1978) types are represented in the differentiation (prospector) and the cost leadership (defender) strategies. Porter's and Miles and Snow's typologies seem to help characterize high success strategies and should be given consideration in future attempts to develop more refined typologies.

The second proposition stated that not all three of Porter's generic strategies would be found in each setting and, in particular, that the "cost leadership" strategy would not be found in the dynamic, rivalrous AC environment. The proposition was supported. One of the high profit DM clusters had almost all the features one would expect of an archetypical cost leadership strategy, whereas none of the high profit AC strategies resembled such a strategy. Apparently, the characteristics of an environment limit the range of "maximally feasible strategies," such that it simply is not accurate to say that all generic strategies are equally viable within an industry.

The third proposition stated that the generic "differentiation" strategy would have different configurations in the two types of industries, traceable to the differing characteristics of the industries. The proposition was supported. Among the relatively stable DMs, the only differentiation strategy (quality-based gendarme) featured quality (comprised of product quality and image). Among the more dynamic ACs, there were two differentiation strategies. One (broad-based differentation) featured quality, affinity with users, and technological protection, very much in line with the product dynamism and product complexity found in this type of enviroment. The other high profit differentiation strategy among ACs featured affinity with users, quality, and product innovation, again very much in line with the changing and complex nature of the product in the AC industry. These results suggest that any broadly "generic" strategy is really a composite of numerous variations, not all of which are equally suited to a given situation.

The fourth proposition stated that market share leaders in the two industry types would differ in their strategies. In each industry type, one high profit cluster was characterized as having large market shares. In each case, the large share strategy was one of differentiation, so the proposition was not supported. Warranting note, however, is the tendency of share leaders to compete via differentation rather than via costs.

The Boston Consulting Group (BCG) advises dominant share businesses to use their experience to drive their costs and prices down in the early stages of the product life cycle (Henderson, 1979). The gap between BCG's advice and the present results can be reconciled through at least two arguments. First, it is possible that share leaders pursue a cost leadership strategy in the early stages of the life cycle but later switch to differentiation. Such midstream changes are possible, but not easy, given the entrenched character that such a strategy usually engenders (Miles & Snow, 1978; Snow & Hambrick, 1980). A second possibility is that not many share leaders choose to follow a cost leadership strategy. Instead, the preferred route may be differentiation. After all, market share can aid in achieving superiority in image, service, distribution, and innovation. And, although no empirical evidence to support it is known, an hypothesis is that, on average, differentiation strategies are more profitable than cost leadership strategies. With a differentiation strategy, prices are bounded primarily by what the product (and its accompanying enhancements) is worth to the customer. With a cost leadership strategy, prices are bounded by the cost structure of the next most efficient competitor. Excluding the possibility of a cartel, it would seem that greater margins usually could be achieved with differentiation.

In accord with the fifth and final proposition, the high profit clusters in each industry type were different from the low profit clusters. Because a synthesis of both high and low profit clusters tends to become cumbersome, the cluster results are viewed in an overall framework.

Synthesis of Clusters

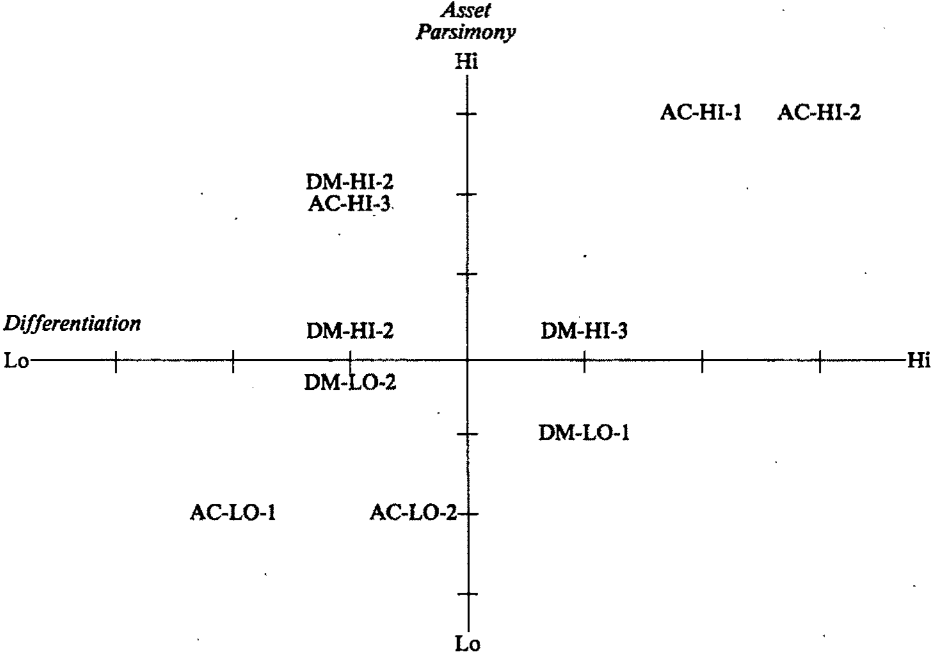
It is useful to develop a concise framework to summarize and contrast the clusters. In particular, the 10 strategies—6 successful and 4 unsuccessful—will be characterized according to the four dimensions discussed earlier: asset parsimony, cost efficiency, differentiation, and scale/scope.

Assume that a nondescript strategy, that is, one with totally neutral characteristics, would receive scores of zero on all four dimensions. Further assume that each distinguishing feature of a cluster (the statistically significant characteristics reported in Tables 2-5) warrants a one-unit increment (or decrement) from zero on the dimension to which it was assigned in Table 1. Take the case of the high-quality gendarme (DM-HI-3). Its negative score on capital intensity warrants a one-unit increment from zero on the asset parsimony dimension; its negative score on capacity utilization warrants a one-unit decrement on the asset parsimony dimension; the result is a net value of zero on asset parsimony. The positive score on market share warrants a score of +1 on scale/scope. The positive score on quality warrants a +1 on differentiation. The lack of any cost efficiency characteristics yields a score of zero on that dimension. All 10 clusters can be similarly scored and located in the four-dimensional space, which is reported here as two two-dimensional figures (Figures 2a and 2b).

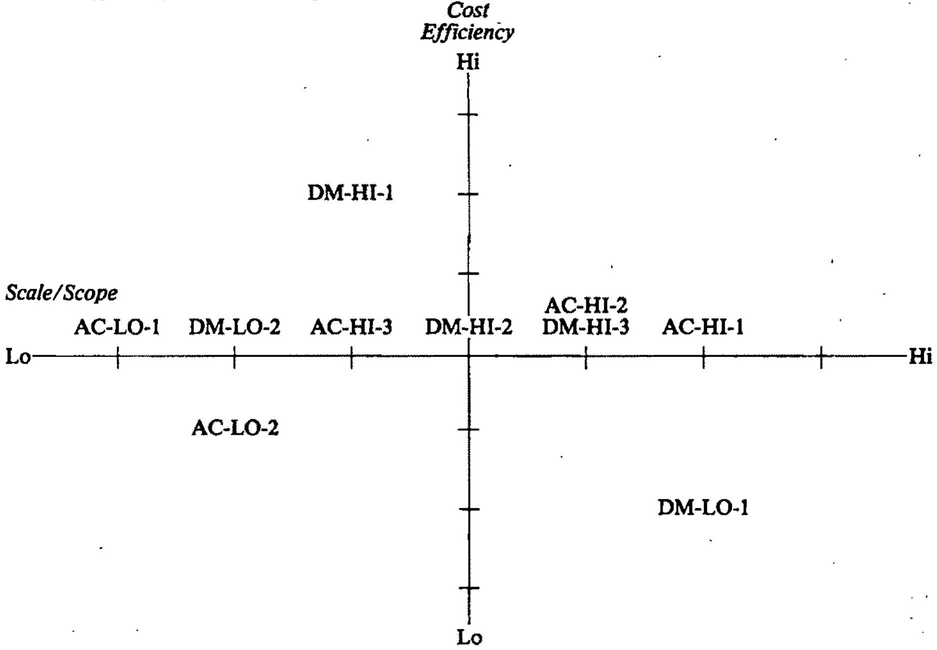
This mapping procedure makes no pretense at precision. The scaling assumptions are many, although the equal unit value given to each distinguishing attribute is justified by its orthogonality following the early factor analysis of the strategic attributes. Despite any shortcomings of this approach, the clusters can be arrayed so that their relative positions can be understood.

Figure 2
Map of Ten Clusters on Two Dimensions

a. Asset Parsimony and Differentiation



b. Cost Efficiency and Scale/Scope



All three high profit AC clusters are distinguished by their high degree of asset parsimony, and the two low profit AC clusters both have low levels of asset parsimony. It has become stylish in strategy literature to talk of "competing" without addressing the costs of competing. If one accepts ROI as a valid measure of performance (the short term versus long term issue aside), then the hazards of abundant assets should be of concern. This is especially true for an industry that is dynamic and competitive, such as the AC. In such an industry, there is great risk of overcapacity or obsolete assets. Hence, moderation and careful planning of capital outlays are of crucial importance.

With the exception of AC-HI-3 (which might be a harvest strategy), high and low profit AC clusters differ fundamentally in their degree of differentiation. Whereas differentiation is strongly associated with high profits in the innovative, dynamic ACs, such is not the case in the more stable DMs.

In general, high and low profit AC clusters are extreme mirror opposites in terms of asset parsimony and differentation. The high and low profit DM clusters, on the other hand, do not exhibit a dramatic disparity along these two dimensions (although the high profit DM clusters are generally "northeast" of the low-profit clusters in Figure 2a). It is suspected that the relatively turbulent nature of the AC environment creates a "feast or famine" syndrome in which products are preferred and capacity well utilized *or* products are passé and capacity is far underutilized. For the DMs, on the other hand, poor performers are lulled but not besieged by a benign, orderly industry. The net result is that low profit DMs might not be totally enfeebled. They might boost their performance through incremental moves, whereas the poorly performing AC must take major steps in order to become profitable.

Again, with the exception of AC-HI-3, high and low profit AC clusters differ greatly in their degree of scale/scope. It could be reasoned that large scale/scope is important for ACs because technological and competitive upheavals limit the time span for recovering capital investment.

Cost efficiency makes limited appearance (AC-LO-1) in distinguishing between high and low profit AC clusters. The pattern is stronger for the DM clusters, with DM-HI-1 having high cost efficiency and DM-LO-1 having low cost efficiency. This selective pattern, too, can be reconciled with the nature of the respective industries. Because the DMs are more stable, price is of relatively great concern to the buyer, and cost control is a primary avenue for managerial attention.

It is noted that three of the four low profit clusters have low scale/scope scores. Here, possible two-way causality must be stressed. Low market share and/or low value added may be "causing" poor profits (following past PIMS-based literature). But poor profits also may be restricting the business in its ability to gain share, add product lines, and generally enhance its scope. That all four clusters with low scale/scope scores also have low differentiation scores suggests that in both types of industries a pervasive but complex causal chain exists among product differentiation, scale/scope, and profits.

In sum, the clusters point to differences in success patterns *between* industries, but they also show alternative avenues to success *within* each industry type. These are, of course, not exhaustive arrays of successful strategies. Nor are they specific enough to aid in the final stages of a strategic choice. However, the clusters should be of use to executives in stimulating discussion and analysis of primary strategic options, either for their own businesses or for their competitors. The clusters might be especially useful for a strategist whose mediocre-performing business aligns with most dimensions of a high profit cluster but is at odds with one or two dimensions. Analysis may be focused on whether these are the one or two key attributes to attempt to alter. For the teacher of strategy, the clusters similarly contribute to a "shorthand" for describing strategies.

Summary

This study has sought to explore how strategies for success differ between two types of mature industrial-product environments. As such, the paper has been an attempt to contribute to a medium-grain contingency view of strategy. The results strongly suggest the following interconnected conclusions:

1. Within an industry type, there are multiple avenues to high profitability.
2. But the array of avenues differs, depending on the type of industry.
3. Similarly, there are some common low profit routes that also differ, depending on the type of industry.

It was not the goal of this paper to create a new typology of strategies. Perhaps such can come out of an eventual analysis of all eight environments reported in Hambrick (1983). Porter's and Miles and Snow's typologies seemed to help characterize the various high success strategies. However, a key conclusion of the study is that asset configuration and utilization are important factors in profitability. It is too early to tell how such factors might figure into future strategic typologies, but there appears to be a case for their inclusion.

The paper's methodological contribution, in no sense unique, comes in its use of cluster analysis. This technique seems particularly well suited for the study of strategy, because interdependencies of attributes are of key importance. In this paper, the technique led to encouraging, interpretable results. Other strategy researchers should consider its use.

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Replacement Versus Expansion: Dilemma for Mature U.S. Businesses[1]

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Patterns of investment in expansion and/or replacement of equipment by strategic business units of U.S. companies in the PIMS data base were analyzed, using a hierarchical framework that assumes that investment decisions are made at two levels: the business level and the corporate level. Strong empirical support was found for the postulated hierarchical framework.

Since the late 1970s the popular press has increasingly expressed concern with the difficulties that mature U.S. industries are experiencing in competing with foreign competitors, both domestically and in overseas markets. Decline in productivity (Bureau of Labor Statistics, 1981) and cost structures inferior to those of some foreign competitors, especially the Japanese (Lohr, 1982), have been cited as the main culprits. Obsolete and inefficient plants of mature U.S. industries have been mentioned as the cause for the decline in U.S. competitiveness: *Business Week* pointed out the existence of outdated steel plants and quoted Lawrence Klein's comment that "we have lived high on the hog and failed to modernize our plant and equipment" ("An Erosion of Saving," 1980, p. 61). Salpukas (1980) reported obsolescent plant and a funnelling of investments to new opportunities, rather than to replacing old facilities, as factors contributing to the malaise of the chemical, steel, automobile, and appliance industries.

Several reasons were proposed for low replacement rates of plant and equipment. Salpukas (1980) stated that business leaders ascribe it to government actions, particularly excessive regulation, which have forced the diversion of funds to environmental protection projects; business leaders also

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ascribe it to a tax system that both drains funds and taxes "inflationary profits." Labor leaders, on the other hand, have been quoted as blaming management for shortsightedness and a tendency to shift capital overseas or to nonunion areas (Salpukas, 1980).

Thurow (1981) charged management with short decision horizons and with reward systems that discourage long run investments. There is a concern that investors and financial analysts place heavy emphasis on short term performance and results, so biasing managerial decision making to emphasize short term payoffs. High interest rates, recessionary pressures, low savings rates, and uncertainty about inflation also were seen as affecting capital expenditure decisions.

From the above it is clear that the decision to invest in plant and equipment demands further attention. This paper reports a study of the plant and equipment investment practices of large, mature U.S. businesses. In particular, it is concerned with identifying factors associated with the tradeoff between replacement and expansion decisions. The paper is not concerned with decisions whether to invest or not, but with the factors that shaped the type of investment decision (expansion or replacement) when the decision was being made.

Literature Review

The literature on investment decisions can be conveniently divided into two main parts. One is the normative literature on replacement emanating from the management science and the finance disciplines; the other is based on economic studies aiming at empirically explaining investment behavior of companies.

Normative Literature on Replacement

The prescriptive literature focuses mainly on the investment in specific pieces of equipment. The classical prescription has been to compare cash flows of investment alternatives over their economic horizon, reduce these to time-equivalent cash flows, and select those projects in which the internal rate of return exceeds the risk adjusted cost of capital. In these treatments there is no inherent distinction between replacement and expansion decisions. The most attractive alternatives are successively selected until funds are exhausted.

Terborgh (1949) and Malcomson (1979) dealt specifically with replacement issues, and they focused on the determination of the (after tax) present value of the stream of cash inflows and outflows associated with replacing equipment at different intervals. Assuming an unlimited investment horizon, they selected the replacement interval that maximizes present value. The determinants of the optimal replacement policy were seen as the purchase and the salvage prices of the equipment and the operating, maintenance, and inspection costs, which were assumed to increase as a function of time. Explicit or implicit in these works were a product-demand function that is either constant or grows at a given rate. In these treatments, no consideration is given to: changes via competitive action; utilization of installed capacity; technological change and product innovation; or changes in efficiency of plant and equipment. It is noteworthy that technological advancement, reflected in the productivity of capital stock, was considered by economists of growth theory at the macro level only (Nelson, 1981).

Edge (1965) was one of the first (and few) to stress the need to consider such factors as tax benefits, impact on working capital, impact on capacity utilization and, particularly, assumptions about future market conditions for the product being produced by the equipment. The firm might find recently replaced equipment obsoleted by changes in market conditions or technology. Edge's approach identified the key *managerial* issues involved in a replacement decision: management is seldom sure what the actual costs and revenues will be in the future and thus is unsure whether the substantial investment in equipment will ever generate an acceptable return. Edge observed that when the replacement decision is being made, much better information on costs and demand is available than when the decision to purchase the original equipment was made. He suggests that perhaps this better information actually leads to less replacement. The importance of the richness of information available once the replacement decision needs to be made is recognized formally by Jorgenson, McCall, and Radner (1967). They argue that optimal replacement decisions are obtained via Bayesian approaches, which continuously add recent information on equipment performance, in determining replacement policies.

So investment decisions are influenced not only by costs (of equipment, operations, and capital) and revenues, but also by management's concerns about the uncertainties involved in competing in dynamic, competitive markets. Management's confidence that long term investments eventually will be profitable in such markets will shape their investment decisions. Of interest in this study are factors that would increase management's confidence that a proposed large investment in replacement or expansion actually will yield a satisfactory return. Because of limitations of the data base used in the study, it is not possible to incorporate another, very important variable that shapes the investment decision—that is, the firm's cost of capital. This is a major, but unavoidable, weakness of the study—the data used do not lend themselves to the study of this variable.

Empirical Studies of Investment

In economic studies several variables have been found to be empirically associated with the investment behavior of companies. Eisner (1967), at the firm level, and Resek (1966) and Evans (1967), at the industry level, found an empirical association between increased capacity utilization and increased investment. Kuh (1963), at the firm level, and Resek (1966), at the industry level, have shown that growth in sales is associated with increased investment. Eisner (1967), in his firm level study, found a positive relation between high levels of profitability and investment. Resek (1966) showed that interest rates were negatively related to new investment, at the industry level. Meyer and Glauber (1964), at the industry level, and Nelson and Neumann (1980), for the steel industry in particular, showed that the availability of internal funding was positively related to investment. Jorgenson and Stephenson (1969) demonstrated that gross value added was positively correlated with investment, and Lindenberg and Ross (1981) in their study of q-ratios found a positive relation between return on sales and investment. All of these studies were instrumental in exploring variables associated with levels of total investment, but they left untreated a number of issues.

First, the replacement decision per se is not addressed. In practice, total investment in plant and equipment is the sum of investment in expansion and investment in replacement. Jorgenson (1971) pointed out that most empirical studies assumed that a constant proportion of overall investment was devoted to replacement (the most common assumption being that a constant percentage of capital stock is replaced every year). This is in line with the assumption that the firm automatically uses its depreciation to replace plant. The above researchers, by postulating a constant replacement level, claimed to be focusing on the expansion decision. However, this treatment of the replacement decision was refuted theoretically by Taubman and Wilkinson (1970).

There is a need to study explicitly the replacement investment decisions rather than assume that they are a proportion of incremental investment: replacement is a substantial component of total investment. Furthermore, the trade-off between investment in expansion and investment in replacement, which until now also has been ignored, deserves study.

A second issue refers to the level of aggregation in the above studies, which focused either at the industry level or at the firm level and therefore are too "coarse grained" to capture factors that operate at the single-business level. A large proportion of U.S. firms are multibusiness and multiunit (Rumelt, 1974); yet decisions to expand or to replace capacity generally pertain to either individual products (e.g., color TV) or production processes (e.g., refining capacity) at the single-business level. This throws some doubt on the appropriateness of industry level studies. Even studies at the firm level have their disadvantages. Most investment decisions in a multiproduct, multibusiness company are made at the business unit level, not for the firm as a whole. For instance, a capacity shortage for a specific product in a multiproduct firm could motivate a decision to expand production capacity, even if average capacity utilization for the whole firm is low. The effect of averaging out capacity utilization across the large number of products thus could obscure this expansion decision.

From the reviews of the two bodies of literature discussed above it became clear that there was a real need to study replacement and expansion separately, at the business unit level. If U.S. managers in general did not replace equipment, there is a need to explore why they made investments when they *did* decide to invest in replacement. Instead of focusing on what managements should do in making investment decisions, the focus in this paper shifts to what they actually do in making investment decisions.

A Managerial Perspective on Investment Decisions

Nelson (1981), in a comprehensive survey of the literature on productivity, expressed the concern that economic variables by themselves are inadequate for explaining productivity differences and growth. Nelson suggested that firms' structures, decision styles, labor-management relations, managerial skills, and the time and cost involved in learning new technologies are all likely to affect the adoption of new technologies. In so doing, Nelson turned the spotlight on management as a major factor affecting productivity and technological change.

For the large, often highly diversified companies that play such a dominant role in the U.S. manufacturing sector, decisions to invest in existing activities should be seen in a context of multiple levels of management. The realities are that most investment decisions to expand or replace originate at the business unit level (Bower, 1970), but the business level management seldom has the necessary resources for making the investment or the authority to secure such resources. The resource allocation decision is made at the corporate (or firm) level. Because other business units in the corporation also are in need of resources, this creates internal competition for funds. The final investment decision depends, first, on whatever business level management will sponsor the investment and, second, on whether corporate level management will approve it once it is sponsored.

So there are two sets of factors that influence whether the investment will take place. First are what will be called *business level* factors, which affect whether the business level management will decide to apply for resources. Second, once the business level management does elect to seek resources, it still has to beat out other internal competitors for these resources. Corporate level management must decide which invesment should be supported. Bower (1970) has shown that because it is difficult for top management to judge the techno-economic feasibility of each proposal with great precision, corporate management relies on the "track record" of the applicant. So there are a number of what will be called *corporate level* factors that are important indications of track record—namely, factors that reaffirm corporate management's faith in the capability of the business unit that is applying for the resources to "deliver" results. Signals of such capability would be such factors as ability to deliver high return on investment (ROI), improve profitability, or generate funds.

Business Level Factors

These factors directly affect the need for, and the feasibility of, a specific investment. It is a contention of this paper that at the business level, for a division under resource constraints, replacement projects are likely to compete for funds with expansion projects.

It has already been found by Resek (1966), Eisner (1967), Evans (1967), and Kuh (1963) that growth in real sales (i.e., inflation adjusted) and in the levels of capacity utilization tend to be positively associated with total investment. Undoubtedly, an increase in unit volume of sales or in capacity utilization of a specific product line is likely to encourage expansion decisions, but concomitantly it is less likely to create pressure to replace old equipment for that product. Further, as a capacity shortage develops, management is likely to be less amenable to replace a smoothly operating facility. The more severe the funds constraints, the more likely that sales growth and potential capacity shortages will drive expansion decisions even at the expense of replacement. So it is hypothesized that high levels of capacity utilization and of real sales growth will be associated positively with expansion and negatively with replacement. If this is the case, then a regression of capacity utilization and sales growth on expansion will yield positive betas and on replacement will yield negative betas. The hypothesized signs of the beta coefficients are entered into Table 1.

Table 1
Independent Variables and Their Hypothesized Impact on Investment

Variables from Literature Survey	*Equivalent PIMS-Based Variables*	*Anticipated Impact*	
		Replacement	*Expansion*
Business level variables			
Real revenue growth	1. Real revenue growth	–	+
Capacity utilization	2. Initial capacity utilization	–	+
Product innovation	3. Percent new products	+	–
Competitive pressure	4. Change in competitors' new products	+	–
Change in labor efficiency	5. Change in sales/employee	–	+
Change in relative costs	6. Change in relative manufacutring costs	+	–
Corporate level variables			
Return on investment	7. Return on investment	–	+
Internal funds availability	8. Change in current asset intensity (excluding cash)	+	+
Control of markets	9. Change in return on sales	+	+
	10. Percent industry imports	–	–
Cost of capital	Not available		
Inflation expectations	Not available		

The level of product innovation also can impact investment decisions. For the firm as a whole it is difficult to hypothesize the impact of product innovation on investment in replacement or expansion; some new products are intended to be substitutes for, and others are designed to be new additions to, the product line. However at the business unit level, especially in mature businesses, new products are more likely to be improved models that substitute for the existing ones. Hence product innovation is likely to create a need to replace equipment by making current facilities obsolete. Product innovation also is likely to reduce the need for expanding capacity for the old models. So product innovation within the business unit is likely to motivate replacement and suppress expansion.

The same impact is expected for change in competitor's new products. The more intense this activity, the less an expansion appears warranted and the more urgent it might be to replace existing facilities with equipment that produces competitive new products. These hypotheses are reported in Table 1 as expected signs of regression coefficients.

Finally, changes in labor efficiency and increases in cost competitiveness may affect both expansion and replacement decisions. Gains in both are likely to reduce the need to replace an existing facility. Also, gains in both are likely to enhance the business's confidence in its own competitive power and so encourage expansion decisions. Thus, increases in efficiency will enhance expansion and suppress replacement. By similar reasoning, increases in cost relative to competition will encourage replacement and discourage expansion, and vice versa. These hypotheses have also been entered into Table 1.

Corporate Level Factors

As mentioned above, the funding of investment projects in large corporations generally has to be approved by corporate management. This practice tends to create competition between the various businesses in the corporation.

In this competition for funds, several factors might influence the ability of business level management to win against other divisions. In prior studies, return on investment (Eisner, 1967) and internal availability of funds (Meyer & Glauber, 1964) were positively associated with investment. In judging whether business level management is capable of delivering what is promised in an investment proposal, Bower (1970) has shown that prior track record is an important consideration. Henderson (1980) has gone so far as to caution against the tendency for senior management to give highest priority in fund allocations to those divisions with high funds-generating records. So a business unit that demonstrates capacity to generate profits and funds is likely to be successful in the internal competition for funding of its projects, be they replacement or expansion. This argument was supported indirectly by findings of Meyer and Glauber (1964), who found that capacity for internal funds generation correlated with investment. For ROI, one might hypothesize a second effect, and probably a more important one. High ROI would tend to work against replacement decisions, for there is no incentive to replace high ROI operations and "change a winning formula," particularly if the calculation of this high ROI is based on old, written-down equipment that would be replaced by new, very expensive equipment. Table 1 predicts that high levels of internal fund generation will be positively associated with replacement and with expansion, and high levels of ROI will be negatively associated with replacement and positively associated with expansion.

The confidence of management in its ability to make investment profitable is another factor that is expected to affect the investment decision. Long term investment decisions that involve substantial commitment of funds are subject to high risk in a competitive environment (Edge, 1965). A corporate management that believes in its business managers' ability to control their marketplace is likely to have confidence in the business's ability to make a return on the investment. Lindenberg and Ross (1981) proposed the use of return on sales as a measure of the "monopoly power" of a business in its marketplace. The higher such monopoly power, the higher the return on sales, and the more confident management will be in its ability to cope with external uncertainties. If business level management is able to increase return on sales consistently, this is an even stronger indication of control of the market. So, increasing return on sales by the business unit will generate corporate confidence in the long run ability of the business unit to compete, and thus would work in favor of an investment proposal, be it for expansion or replacement. The above hypotheses are entered into Table 1.

Finally, financial variables, for example, interest rates and stock prices, have been found to be correlated with investment decisions (Grunfeld, 1960; Resek, 1966). Both factors are determinants of the firm's cost of capital, so they are likely to be related to the total level of investment. Unfortunately, these important factors are not available in the data base and were not studied. No hypotheses were entered into Table 1.

In summary, the conceptual framework used in this study of managerial investment decisions is attempting to supplement traditional economic variables with variables derived from management theory. Investment decisions for replacement and expansion are viewed as being generated at the business level and ratified at the corporate level. Furthermore, at the business unit level replacement decisions are seen as competing with expansion decisions for scarce resources. At the corporate level, the sponsoring business level management is seen as having to demonstrate a capacity to deliver results in order to win the internal competition for funds.

Methodology

The Sample

The ability to conduct empirical investigation of investment decisions at the business unit level is predicated on the availability of data at this business unit level. Although past studies have been hampered by the lack of such data, the longitudinal Profit Impact of Marketing Strategies (PIMS) data base (SPI.YR) is organized by "strategic business units." This data base was made available for the study. The PIMS data base was developed by the Strategic Planning Institute as a service program for participating companies. It is subscribed to by approximately 300 firms, which annually submit detailed information on about 2,500 business units.

The PIMS data base has two important characteristics that enhance its reliability and usefulness for the research study. First, subscribing firms pay a substantial subscription fee and use the data base as an aid in their own strategic planning. Thus they have a vested interest in the accuracy of the information they submit. Second, the staff of the Strategic Planning Institute is involved in assisting member firms in preparing the information they research, so a reasonable level of consistency is achieved across firms. A disadvantage is that the security of the data provided by subscriber firms is maintained by coding it or by having it stated in ratio form. Thus data are available only in this form. For more detailed information and for evaluations of the data base, see Anderson and Paine (1978) and MacMillan, Hambrick, and Day (1982).

In this study, the SPI.YR file was partitioned to yield only those businesses of manufacturing firms with five or more years of data on file. The study was limited further to businesses in the "mature" stage, that is, those having industry real sales growth between 0 and 10 percent per annum. This range of industry growth rates ensures that all businesses that could be construed as being in mature, nondeclining industries are included.

Finally, because investment decisions are likely to be related to general economic conditions, it was decided to analyze the data for two periods: first, the period 1970-1976, when the first shocks of inflation were experienced in the U.S. economy; second, 1977-1980, when U.S. industry was subjected to further inflationary shocks but after management had had several years to adapt to managing under sustained inflationary conditions. The idea was to see whether investment behaviors changed substantially in the two inflationary periods.

Specification of Variables

The precise formulae defining the variables in detail are available from the authors.

Dependent Variables. Balance sheet data, available for each business in coded form, were used to estimate the incremental investment in each particular year. Percentage total incremental investment was defined as the sum of depreciation and of change in net book value of plant and equipment divided by net book value at the beginning of the year. To account for price inflation in capital goods (Evans, 1967; Jorgenson & Stephenson, 1969) the total investment figure was deflated by the official Producers Price Index for capital goods for that year. The resulting total incremental investment in real terms was accumulated for a 4-year period, then divided by the deflated net book value of plant and equipment in the initial year, to yield the 4-year real total incremental investment as a percent of the initial net book value.

$$\text{Total incremental investment} = \sum_{n=2}^{4} \left[\frac{(NBV_n - NBV_{n-1} + DEP_n)}{PPI_n} \Big/ \frac{NBV_{n-1}}{PPI_{n-1}} \right]$$

where NBV_n = net book value year_n; DEP_n = depreciation; PPI_n = price index for investment goods.

Next, expansion investment was calculated from the standard capacity variable reported in the PIMS data base. Subscribing firms report their standard capacity each year as the maximum current dollar volume of output that can be produced with facilities in "normal" operation. Deflating this for a given year by the company's own price index resulted in a measure of unit capacity for that year. The percentage change in unit capacity over the 4-year period was then calculated, to obtain the expansion investment variable.

$$\text{Investment in expansion} = \frac{\left[\dfrac{\text{Standard Capacity}}{\text{Price Index}}\right]_{\text{Year 4}} - \left[\dfrac{\text{Standard Capacity}}{\text{Price Index}}\right]_{\text{Year 1}}}{[\text{Standard Capacity/Price Index}]_{\text{Year 1}}}$$

where standard capacity = dollar sales value of production capacity; price index = respondent company's price index.

Finally, percentage replacement investment was estimated as the difference between total incremental investment and expansion investment for the 4-year period. Note that this method formally includes simultaneous replacement and expansion: any investment that does not go for actually expanding capacity is counted as a replacement.

This last variable somewhat overstates replacement, in that investment in nonproductive assets (such as environmental protection equipment) would be included as replacement investment under this formula. On the other hand, the variable as defined also understates replacement by the amount realized by the sale of old facilities at their stated net book value. This latter factor is likely to be small, however.

Thus: Expansion Investment = Percentage Change in Real Capacity

and Replacement Investment = Percentage Change in Total Investment − Expansion Investment

With these definitions, an investment that expands capacity while replacing obsolete equipment is automatically considered, because expansion is calculated first.

Independent Variables. The PIMS variables used to approximate the constructs discussed earlier as determinants of investment decisions are listed in Table 1. A key factor in the selection of these variables was avoidance of multicollinearity. Thus several correlation matrices reflecting correlation among alternate measures of the same constructs were run and examined. The final variables selected were a set of PIMS variables in which low levels of intercorrelation were obtained.

The measure for real revenue growth was the 4-year average of the corresponding PIMS variable. Capacity utilization was the PIMS variable: percent of capacity utilization for the initial year of the 4-year periods studied. Product innovation was approximated by PIMS' percent new products, modified to yield a 4-year average of new product sales as a percent of total revenues. To capture competitive pressure via product innovation, the PIMS variable, percentage change in competitor's sales from new products, was adopted. Improvement in labor efficiency was estimated by calculating the change in sales per employee (annual); and change in cost competitiveness was estimated by PIMS' variable, change in relative direct manufacturing cost. Return on investment was reflected by an annual average return on investment (PIMS variable). The change in the ability of the business to generate and retain funds was reflected by the 4-year average change in current assets excluding cash. (Because many business units within the corporation do not hold cash, cash was excluded from all calculations.) Finally, the approximation to management perception of its control (or power) in the marketplace was made via two variables. First was change in real return on sales (annual) with profits adjusted for price inflation. Return on sales was suggested by Lindenberg and Ross (1981) as a measure of monopolistic power. Second, the PIMS variable, percent industry imports, was used to reflect the threat of overseas competitors. All variables are listed in Table 1 with their hypothesized impact on the expansion and the replacement decisions.

Procedure

To control for extreme data, all businesses reporting total incremental investment (as defined) over 200 percent or under -100 percent were removed from the sample. For the remaining businesses means and standard deviations were calculated for all variables. Multilinear regressions of independent variables on expansion and replacement investment were computed. In accordance with standard PIMS recommendations, in all regressions 5 percent outliers were removed to control for erroneous data.

Results and Discussion

Summary Statistics

The summary statistics for dependent and independent variables are presented in Table 2. Significant differences between means are reported in the last column. There are a number of interesting differences between the two periods. First, it is clear that mature businesses *have* started to replace more aggressively: significantly more replacement took place in 1977-1980

Table 2
Summary of Statistics for Dependent and Independent Variables of Mature Businesses

	1970-1976 n=248		1977-1980 n=197		
Sample Size	Mean %	S.D. %	Mean %	S.D. %	Significant Differences of Means
Dependent variables					
1. Investment in replacement, annual[a]	10.8	17.2	13.3	15.2	*
2. Investment in expansion, annual[a]	3.1	10.1	3.6	8.9	
Independent variables—business level					
3. Real revenue growth	11.5	41.8	17.7	36.1	
4. Initial capacity utilization	77.1	19.9	74.5	19.1	
5. Percent new products	9.4	16.3	5.3	10.1	*
6. Change in competitors' new products	.15	3.03	.08	3.5	
7. Change in sales/employee	23.8	25.8	24.1	24.3	
8. Change in relative manufacturing costs	–.09	1.76	–.10	1.48	
Independent variables—corporate level					
9. Return on investment	21.4	27.4	24.5	25.5	
10. Change in current asset intensity	–.49	3.64	–1.30	3.30	*
11. Change in return on sales	–7.8	14.1	–3.9	7.4	*
12. Percent industry imports	3.85	5.68	5.74	8.37	*

[a] Average, Annual. The regression analysis was done on total investment over 3 years. These are averaged by dividing by 3.

*$p \leq .05$, one-tail t-test

(13.3 percent annually) than in 1970-1976 (10.8 percent annually). Another major difference is the significant reduction of new product activity in mature industries over the decade. The 1970-1976 new product activity was almost double that of the 1977-1980. At the same time the average impact of imports increased significantly, from nearly 4 percent to nearly 6 percent of total industry sales. Current asset intensity was reduced significantly, and there was a dramatic slowdown in the rate of erosion of returns on sales (from nearly –8 percent to –4 percent). The picture that emerges for mature businesses is a move to "conservatism and conservation" during the decade. In the face of threats from imports, businesses appear to have moved to reduce current asset intensity, to curtail new product activity, to halt erosion of sales margins, and to replace equipment. This shift to a more conservative posture should be reflected in the regressions reported below.

Regression Analysis: Expansion vs. Replacement

Correlation matrices for the mature businesses for the periods 1970-1976 and 1977-1980 appear in Table 3. The low level of intervariate correlations (i.e., virtually no multicollinearity) is noted and is attributable to the care taken in selection of variables. The results of the regression analysis are in Tables 4 and 5. Attention here is given to only those results that had significant coefficients.

The model tested explains a substantial proportion of the variance of the dependent variables, for both replacement ($R^2 = .33$ and .38) and

Table 3
Correlation Matrix of Independent Variables[a]

	ΔREV	CAPU	%NP	ΔCOMP %NP	IMPORTS	ΔROS	ROI	ΔSALES/EMP	ΔDIR. COST
1970-1976									
CAPU	−.21	—							
%NP	.07	−.02	—						
ΔCOMP %NP	−.03	.05	−.09	—					
IMPORTS	−.02	.07	.12	−.15	—				
ΔROS	−.46	.01	.07	.00	.10	—			
ROI	.06	.02	.00	.01	−.03	.06	—		
ΔSALES/EMP	.03	−.02	−.03	−.02	−.05	.00	−.04	—	
ΔDIR. COST	−.02	.05	−.13	.08	.03	.06	.18	.07	—
ΔC. ASSET/REV.	−.31	.12	−.03	.11	−.05	.18	.06	−.04	.00
1977-1980									
CAPU	−.35	—							
%NP	.08	−.12	—						
ΔCOMP %NP	.12	−.10	−.19	—					
IMPORTS	−.03	−.05	.05	.04	—				
ΔROS	−.19	.01	.02	−.04	.08	—			
ROI	−.06	.15	−.22	.01	.03	.10	—		
ΔSALES/EMP	.03	.02	.02	.05	−.05	.04	−.03	—	
ΔDIR. COST	−.10	−.02	−.12	.08	.02	.02	.05	.04	–
ΔC. ASSET/REV.	−.20	.24	.02	−.22	.11	.21	.11	.05	.05

[a] ΔREV = Real revenue growth; CAPU = Initial capacity utilization; %NP = Percent new products; ΔCOMP %NP = Change in competitors' new products; IMPORTS = industry imports; ΔROS = Change in return on sales; ROI = Return on investment; ΔSALES/EMP = Change in sales per employee; ΔDIR. COST = Change in relative manufacturing costs; ΔC. ASSET/REV. = Change in current asset intensity.

Table 4
Regression Results of Investment Behavior

	1970-1976		1977-1980	
	Replacement	Expansion	Replacement	Expansion
Sample size	248	248	197	197
R^2	.33[a]	.60	.38	.49
F-significance	.001	.001	.001	.001
Business level variables				
1. Real revenue growth	−.11*	.62***	.18***	.56***
2. Initial capacity utilization	−.15**	.44***	−.12*	.48***
3. Percent new products	.15**	.05	−.12*	.07
4. Change in competitors' new products	.05	.04	.04	−.03
5. Change in sales/employee	−.01	.04	.06	−.04
6. Change in relative manufacturing cost	.12*	−.10*	.20***	−.13**
Corporate level variables				
7. Return on investment	−.02	.02	−.15**	.01
8. Change in current asset intensity	.30***	.05	.15**	−.02
9. Change in return on sales	.19***	−.01	.46***	.12*
10. Percent industry imports	−.21***	.05	−.06	.06

[a] 5 percent outliers removed for all regressions.

*$p \leq .05$

**$p \leq .01$

***$p \leq .001$

expansion decisions ($R^2 = .60$ and .49, Table 4). In all cases $p \leq .001$. The model explains significantly more variance in the expansion decision than in the replacement decision.

A basic hypothesis of this study was that at the business unit level, replacement decisions compete with expansion decisions, so that certain factors that support replacement tend to suppress expansion, and vice versa. Table 4 supports this basic hypothesis. Table 1 predicted that for variables 1 to 7 there would be opposite signs of the beta coefficients for replacement and expansion. In Table 4 it can be seen that this occurs in the predicted direction for 9 out of the possible 14 cases. For any one case, there are four possible combinations of signs (+ +, + –, – +, or – –), so that there is a .25 chance that the predicted patterns will occur at random. Because there are 14 "tests" and 9 "successes" (when the predicted patterns did occur), then by the binomial distribution, $B(9|14, .25), p<.01$. This strongly supports the hypothesis that the predicted patterns were not obtained by chance.

As anticipated, these results indicate that most factors that are positively associated with replacement are negatively related to expansion and vice versa. So most investment decisions appear to be the result of a trade-off between expansion and replacement.

Regression Analysis: Expansion Investment

The results of the regression analysis of expansion investment on the independent variables for the two periods are presented in the right-hand columns of Table 5. Virtually the same factors are associated with the expansion of productive capacity for both periods, 1970-1976 and 1977-1980.

Table 5
Regression Results of Investment Behavior of Mature Businesses: Hypothesized and Actual Signs

	Replacement Investment			*Expansion Investment*		
	Hypoth.	*Actual Sign*		*Hypoth.*	*Actual Sign*	
Variables	*Sign*	*1970-1976*	*1977-1980*	*Sign*	*1970-1976*	*1977-1980*
R^2		.33	.38		.60	.49
F-significance		.001	.001		.001	.001
Business level variables						
1. Real revenue growth	–	–*	+***	+	+***	+***
2. Initial capacity utilization	–	–**	–*	+	+***	+***
3. Percent new products	+	+**	–*	–		
4. Change in competitors' new products	+			–		
5. Change in sales/employee	–			+		
6. Change in relative manufacturing costs	+	+*	+***	–	–*	–**
Corporate level variables						
7. Return on investment	–		–**	+		
8. Change in current asset intensity	+	+***	+**	+		
9. Change in return on sales	+	+***	+***	+		+*
10. Industry imports	–	–***		–		

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

Four variables appeared to have a significant and strong relationship with the expansion decision in both these periods. Real revenue growth and initial capacity utilization were positively related to expansion. This was as hypothesized: Businesses tend to expand capacity when real sales grow and when capacity shortages threaten.

As expected, change in relative manufacturing cost was negatively correlated with expansion in both periods. A decline in cost competitiveness is likely to discourage expansion of facilities. Finally, in 1977-1980 change in real return on sales significantly correlated with expansion investment in the expected direction. Increased return on sales indicates a reassuring ability to control the markets in which a business operates.

In summary, management was inclined to expand capacity primarily because demand for the products grew and a shortage of capacity became a threat. On the other hand, no incentive to expand was found when cost competitiveness was declining and margins on sales were shrinking. It appears that management is deterred from investing in expansion if its perceived ability to make the investment "come right" is eroding. Sales growth and increasing capacity utilization reflect a pressure to expand because of demand. Cost competitiveness and margin control reflect management's ability to control the destiny of the new investment. Pressure to expand and "control of destiny" therefore are important factors in management's willingness to expand facilities. Their explanatory power overshadows all the other variables.

Regression Analysis: Replacement Investment

The regression results for replacement investment are presented in the left-hand columns of Table 5. As was indicated in Table 2, the investment in replacement was significantly higher in the second period, reflected by both the increase in the mean and the decrease in the standard deviation. The earlier comment that the second period appeared to be characterized by "conservatism and conservation" appears to be supported by the regression analysis.

Investment in replacement was associated negatively with initial capacity utilization and positively with change in relative manufacturing cost. These relationships were expected. High initial capacity utilization encourages expansion of capacity, to the detriment of replacement. On the other hand, the need to be more cost competitive is a strong stimulus to replace obsolete assets, to the detriment of expansion investment.

The next variable that was strongly and positively related to investment in replacement is the change in current asset intensity (excluding cash), for which a positive correlation with replacement was hypothesized, on the assumption that this variable reflects the capacity of the businesses to generate internal surpluses or slack (Cyert & March, 1962). As such slack increases, it might be easier to persuade corporate management to invest in replacing old facilities, because the business unit would be demonstrating an ability to control its markets by generating such surpluses.

The very strong predictive power of this variable prompts a thorough discussion of its implications. First, although the change in current asset intensity could signal a capacity to generate surpluses, as hypothesized, it also could be interpreted as representing a distress condition, that is, accumulation of inventory and difficulty in collecting receivables. Under this interpretation, the positive correlation with the replacement activity could be construed as being in line with decreasing cost competitiveness and low capacity utilization.

The full interpretation of the relation between change in current assets and replacement needs to be done in the light of its correlation with other variables. If change in current asset intensity is indicative of distress conditions, one would expect it to be: negatively correlated with capacity utilization (current asset accumulation); negatively correlated with return on investment (reduced profitability); and negatively related with change in return on sales (reduced control of markets). On the other hand, if change in current asset intensity is indicative of increased control of markets, then there should be positive correlation with the above variables. A review of the correlation matrix in Table 3 reveals a positive correlation with all of these variables. This strongly suggests that changes in asset intensity are associated with increases in control over markets and that business unit managers who can profitably generate increased current asset intensity find themselves in a better position to win the internal competition for funds.

Return on investment was found to be negatively related with replacement investment, as expected, though only in the second period. This supports the proposition that when profits are high management has little, if any, motivation to replace old assets and change a "winning formula." Alternatively, when ROI is low, there is an incentive to replace old assets. The market share that imports had captured was expected to be negatively related to replacement activity. This was found to be the case, but only for the first period. Probably, by the end of the decade the pressure of imports became so great that firms were compelled to replace equipment in order to compete at all. Change in real return on sales was assumed to reflect the business's control over its markets. The strongly significant positive relationship for both periods supports this: as management feels more confident in its ability to control the destiny of the investment, it will be more inclined to invest in replacement.

Two of the variables that were significantly associated with the replacement investment had opposite signs in the two periods studied. Real revenue growth, hypothesized to relate negatively with replacement, was indeed so related in the first period, but it had a positive association the second period. This apparent contradiction is difficult to explain. Possibly, as facilities grew older over the decade, the imperative to replace them became ever stronger, and high levels of growth in sales enhanced management's confidence in the future of the product. So management was more willing to invest in replacing old assets in the latter half of the decade. Percent new products is another variable for which the sign of the correlation coefficient was different for the two periods. New products should encourage replacement (the old facilities being less suitable for the new products). This happened in the first period, but the opposite happened in the second period. It is probably characteristic of the second period of "conservation and conservatism," when considerable curtailment of new products took place (Table 2). This could have caused an increased emphasis on asset replacement for existing products.

In summary, management decisions to replace assets can be visualized as being driven by two sets of factors, reflecting pressure and confidence. Pressure was seen in the form of distress signals (e.g., decline in cost competitiveness, decline in capacity utilization, and decline in real growth of sales), which were all correlated with an increase in replacement activity. Variables affecting management's confidence (market share of imports, changes in current asset intensity, changes in return on sales) also were significantly related to the replacement decision. Apparently the pressure to replace emerges from conditions of distress, but the final decision to replace also has to be driven by the confidence of management that it has enough control over events to assure a return on the investment.

It is noted that similar factors, pressure and confidence, also were associated with management decisions to expand. However, expansion pressure comes from market pull (sales growth and demand outgrowing capacity), and replacement pressure comes from business distress. Yet, in both cases, management confidence in the outcome is necessary for the decision to be made.

Summary and Conclusions

This study considered investment decisions made by business units of mature, large U.S. companies during the decade 1970-1980. Literature by economists and management-scientists was reviewed, and a managerially-oriented conceptual framework was developed to predict the phenomena that impact replacement and expansion decisions. Longitudinal data on 445 mature U.S. manufacturing businesses were extracted from the PIMS SPI.YR data base. Regression analyses were performed for two periods, 1970-1976 and 1977-1980, on investment in replacement and investment in expansion.

Several variables proposed by economists and management-science scholars emerged as significant in explaining investment behavior. Capacity utilization, real sales growth, return on sales, return on investment, and internal funds generation were all significantly correlated with investment patterns. The contribution of many economic studies to the explanation of investment decisions was demonstrated as important and indisputable. However, this research takes the study of equipment investment decisions several steps beyond the previous works. First, it studied the decision to invest in plant and equipment at the business unit level, and not at the industry or the total firm level. Factors that have been found significant in explaining expansion investment at the industry or firm level were also found significant in this business level study, lending support to the findings of earlier studies. It was this study's premise, however, that investment decisions are *initiated* and sponsored by the management at the business level and *ratified* at the corporate level. Therefore, the business unit is the appropriate level of study.

It is in the latter focus that this study differs from its predecessors. It not only deals with a set of economic variables, but it incorporates these in a broader framework, taking a multilevel perspective. The variables used were interpreted in the context of management decisions at the business and the corporate levels, yielding a more refined understanding of equipment investment decisions. The management orientation thus complemented the economic variables and placed them in the meaningful context of the two levels of organization decision making discussed in the policy literature (Hofer & Schendel, 1978), namely, corporate and business levels.

Third, the equipment investment decision in this study was decomposed into its two component parts, replacement and expansion. The replacement decision was formally studied, not assumed to be a proportion of total investment. It is this decomposition that resulted in some important insights gained in this study: expansion investments and replacement investments do not correlate positively. The expansion decision could be interpreted as driven basically by market demand pressures and reinforced by factors that increase confidence that the business has control over its markets. On the other hand, the replacement decision is driven by competitive distress pressures, but it also is reinforced by management confidence in its control of markets. Replacement was found to be positively associated with a decline in competitive cost position, lower capacity utilization, increases in new product introduction, and decreases in real revenue growth. Initially, growth of imports tended to suppress replacement investment, as did real revenue growth, but this impact apparently was reversed later in the 1970s. Improved market power positions of the business in the market (measured by change in real return on sales and a change of current asset intensity) were strongly related as stimulants of the replacement decision.

In the last decade, 1970-1980, there was a shift in the investment pattern of the large and mature businesses studied. Investment in replacing assets picked up steam toward the end of the decade. Investment in expansion of capacity appeared to remain low throughout the decade. In that decade, margins on sales declined, imports captured a higher market share, and new product introductions slowed down drastically. It appears that management became more inclined to emphasize the tried and proven products, rather than new ones.

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Research Notes

USING SIMULTANEOUS STRUCTURES TO COPE WITH UNCERTAINTY[1]

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Although most research on the structure of work units within organizations assumes that each work unit employs a single, relatively unchanging structure (Comstock & Scott, 1977; Huber, O'Connell, & Cummings, 1975; Lawrence & Lorsch, 1969; Leifer & Huber, 1977; Van de Ven, 1976; Van de Ven & Delbecq, 1974), it is suggested here that each work unit in fact uses several structures simultaneously to deal with the variety of contingencies it faces.

The situation facing many work units frequently is complex in terms of both the tasks that it must perform and the environment with which it must cope. Work units typically are expected to accomplish a number of different tasks that may vary in terms of their complexity and predictability. At the same time, they must cope with an internal environment—for example, other work units—as well as with external environmental factors such as government regulations, suppliers, and technological changes. It seems unlikely that a single structure would be capable of effectively handling this complex array of factors, all of which must be dealt with simultaneously. Indeed, prior research has found that the same structure will not be equally effective in different situations.

A few researchers have examined the use of multiple structures and have found that as work units face varying demands from their tasks and environments, more effective units will *adapt* their structures. For example, Duncan (1973) found that the same decision unit used a mechanistic structure for making routine decisions and then shifted to an organic structure for making nonroutine decisions, and that this was done in accordance with perceived changes in the environment. Johnston (1976) found that the design of a small consulting company fluctuated dramatically from a mechanistic formal design to one that was more organic-adaptive, in response to changing individual and organizational goals. The temporary fluctuations resulted in a better fit between the structure of the organization and the task and environmental demands.

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However, these studies still imply that sufficient task and environmental homogeneity exists for a work unit to rely on a single structure for a period of time. Here, it is argued that some members of a work unit may perform routine tasks and *at the same time* other members perform nonroutine tasks. For example, in a work unit in the computer systems department of an insurance company, some members would be engaged in the rather routine task of coding a COBOL print routine. At the same time, other members of the unit would be engaged in the less routine task of designing an entirely new system. It also is argued that a work unit's environment is heterogeneous. An examination of environmental factors outside of the work unit but inside the organization (e.g., other work units) might reveal a relatively stable and certain environment. But, when the focus shifts to government regulations that impact on the work unit, one is just as likely to find this environmental factor to be quite uncertain and shifting. Thus, the same work unit may, *at the same time*, face several subenvironments, each of which is more or less uncertain.

If work units are to cope effectively with these simultaneously complex contingencies, it follows that each work unit must operate several different structures simultaneously. More precisely, it is suggested that various combinations of structural dimensions—for example, the extent to which decisions are centralized, the division of labor, and the use of rules and procedures—will be used as the need arises. Supervisors of work units may call on various structural dimensions at different times, combining them to achieve the goals of the unit, or the supervisor may employ different structures at the same time for use by different individuals or groups within the work unit. One would expect that supervisors would tend to rely on structures that have been used in the past whenever possible, making modifications only when new or different situations are encountered.

Thus, it is hypothesized that more effective work units will employ several different structures simultaneously. It is hypothesized further that more effective work units will employ an organic structure—that is, few rules and procedures, a broader division of labor, and decentralized decision making—when tasks are nonroutine and the environment is uncertain and at the same time will employ a more mechanistic structure—that is, many rules and procedures, a narrower division of labor, and centralized decision making—when tasks are routine and the environment is certain.

Method

The sample consisted of 12 work units from a manufacturing organization and 9 work units from an insurance organization. A work unit was defined as a supervisor and his subordinates (there were no women supervisors in the sample), all of whom performed related tasks. Size of the units ranged from 3 to 12 members, with the average unit containing 6 members. Work units in the sample included, among others, purchasing, manufacturing engineering, personnel, computer systems, and quality control.

Tasks performed in these units ranged from rather routine ones that typically involved following preprogrammed routines, such as maintaining production schedules, processing payoffs, preparing engineering drawings, to nonroutine tasks that involved more discretionary activity, such as developing a program of variable work hours, solving engineering problems, and designing new computer systems.

Procedure. To determine whether different structures are used in different situations, that is, routine tasks/certain environment and nonroutine tasks/uncertain environment, it was necessary first to develop a separate set of "scenarios" that illustrate these situations for each work unit. The scenarios illustrating each situation were developed on the basis of structured interviews with each work unit supervisor. Each supervisor was asked to list four routine and four nonroutine tasks that were performed by members of their work unit. Routine tasks were defined as tasks that are simple and straightforward and have little variability. Supervisors then were asked to indicate for each task which environmental factor or factors had an important bearing on the performance of that task. Finally, they were asked to indicate how unpredictable they felt each of these environmental factors was. The results of these interviews indicated that all but one of the sampled work units encountered both situations, that is, routine tasks/certain environment and nonroutine tasks/uncertain environment.

The scenarios, as described by a supervisor and using jargon relevant to the work unit, then were transposed to the questionnaires that were administered to all members of that supervisor's work unit only. Examples of the scenarios found in a computer system work unit appear in Table 1.

Table 1
Scenarios for a Computer Systems Work Unit

Situation	*Scenarios*
Routine tasks/certain environment	Application of systems releases for packaged systems, including review of changes and test output with user departments
Nonroutine tasks/uncertain environment	Systems studies and evaluations of new applications (phase 0 and 1)

Members of the work unit then were asked to read each scenario (as described by *their* supervisor and pertaining to *their* work unit) and respond to nine questions about the structure that was actually used in each situation. In this manner it was possible to determine if different structures were used in different situations encountered within the same work unit.

Measures of Structure and Effectiveness. Measures of structure were based on Duncan (1973) and Sathe's (1974) questions pertaining to centralization, division of labor, and formalization. Examples of the questions asked are: "Any decision I make has to have my supervisor's approval" (centralization); "The rules and procedures are developed as I go along" (formalization); "I engage in many kinds of activities" (division of labor).

Reliability coefficients were determined for each situation because it was possible that the reliability of the scores might vary with the situation. Coefficient alphas ranged from .64 to .88 for each dimension with the exception of division of labor (for routine tasks/certain environment), which was .43.

Data on centralization, division of labor, and formalization for each work unit were obtained by averaging the responses from each person in the work unit across each structural dimension. The work unit averages were used in the subsequent data analysis.

An effectiveness measure developed by Tushman (1979) was used to classify work units as more or less effective. Effectiveness ratings were obtained from all executives in both organizations who were familiar with one or more of the work units being studied. Units were rated on an effectiveness scale from 1 (high) to 5 (low) on the basis of their budget and cost performance, adaptability, ability to get along with others, and so on. On the average, each unit was rated by two executives. Interrater reliability was acceptable: none of the scores for the same unit varied by more than one response category. As in previous research (Lawrence & Lorsch, 1969; Tushman, 1979), scores were averaged across individual raters to provide overall measures of unit effectiveness. Based on the distribution of unit effectiveness scores, there appeared to be two distinct clusters from which more and less effective work units could be determined. The 13 units with scores of 2.3 and below formed 1 cluster and were labeled less effective work units, and the 8 units with scores above 2.3 formed the second cluster and were labeled more effective work units.

This measure of overall effectiveness may reflect the work unit's ability to shift from structure to structure or to maintain several different structures simultaneously. Although a measure of overall effectiveness tells how well a unit is performing on the whole, it does not reveal the situations in which the unit performs well and not so well. It is possible that a work unit can perform quite well in one situation but not well overall or, conversely, poorly in a particular situation but quite well overall.

Results

The first part of the hypothesis stated that more effective units will employ different structures simultaneously. To test this hypothesis, a MANOVA was run on more effective work units. A MANOVA was used in order to determine if significant overall differences exist between the means of centralization, division of labor, and formalization across the two situations, routine tasks/certain environment and nonroutine tasks/uncertain environment. The multivariate F is significant ($F=3.03, p<.001$), indicating that significant differences do exist. This supports the general notion that different structures were used in the different situations encountered by the same work unit.

Table 2
Means, Standard Deviations, and Confidence Intervals of Structural Dimensions in More Effective Work Units[a]

Structural Dimensions	*Routine Tasks/ Certain Environment*	*(S.D.)*	*Nonroutine Tasks/ Uncertain Environment*	*(S.D.)*	*Confidence Intervals*
Centralization	1.9[b]	(.9)	2.8	(1.6)	$-.97 \leq \tau_{11} - \tau_{41} \leq -.83$[c]
Division of labor	2.5	(1.1)	2.7	(1.2)	$-.27 \leq \tau_{12} - \tau_{42} \leq -.13$[c]
Formalization	5.0	(1.1)	4.8	(1.4)	$.12 \leq \tau_{13} - \tau_{43} \leq .28$[c]

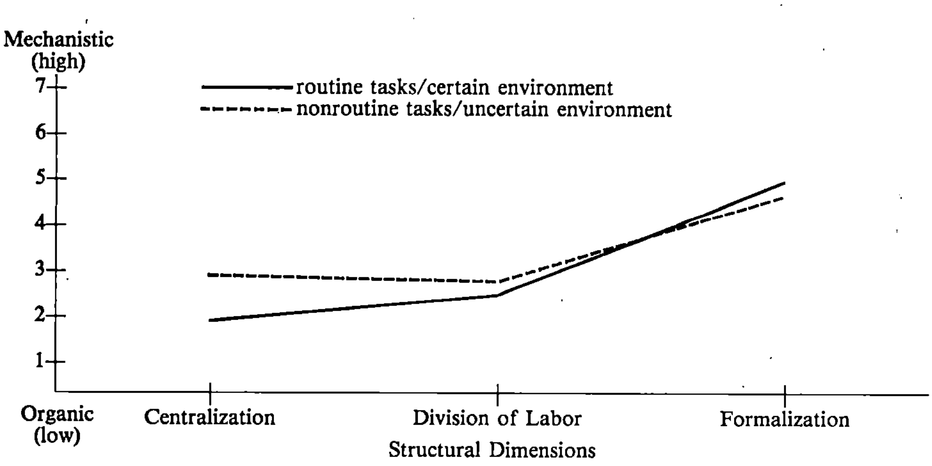
[a] The number of more effective work units = 13.

[b] The higher the number, the more mechanistic the dimension; the lower the number, the more organic the dimension.

[c] Significant at $p = .01$.

However, a MANOVA does not indicate the structural dimensions for which the differences are significant. Because individual pairwise comparisons are inappropriate when a MANOVA is used, a multiple comparisons procedure (Morrison, 1976) was used to determine which structural dimension means differed significantly across the two situations. Confidence intervals stemming from this procedure are reported in Table 2, along with the means and standard deviations of centralization, division of labor, and formalization for more effective units. The data indicate that the means of all three structural dimensions differ significantly ($p = .01$) across the two situations. However, for two of the structural dimensions, centralization and division of labor, the data show that greater centralization and division of labor are associated with nonroutine tasks and an uncertain environment. These results are in the opposite direction from that predicted. Figure 1 shows the structural profiles of more effective units in each situation.

Figure 1
Structural Profiles for More Effective Work Units



A MANOVA also was run on less effective units to determine if significant overall differences exist between any of the structural dimension means. Surprisingly, the multivariate F is significant ($F=2.24$, $p=.009$). Table 3 shows the structural dimension means, standard deviations, and confidence intervals for each situation for less effective units.

Table 3
Means, Standard Deviations, and Confidence Intervals of Structural Dimensions in Less Effective Work Units[a]

Structural Dimensions	*Routine Tasks/ Certain Environment*	*(S.D.)*	*Nonroutine Tasks/ Uncertain Environment*	*(S.D.)*	*Confidence Intervals*
Centralization	2.3[b]	(1.2)	3.1	(1.6)	$-.88 \leq \tau_{11}-\tau_{41} \leq -.70^c$
Division of labor	2.9	(1.3)	2.9	(1.4)	$-.08 \leq \tau_{12}-\tau_{42} \leq -.08$
Formalization	5.2	(1.3)	4.6	(1.5)	$.52 \leq \tau_{13}-\tau_{43} \leq .68^c$

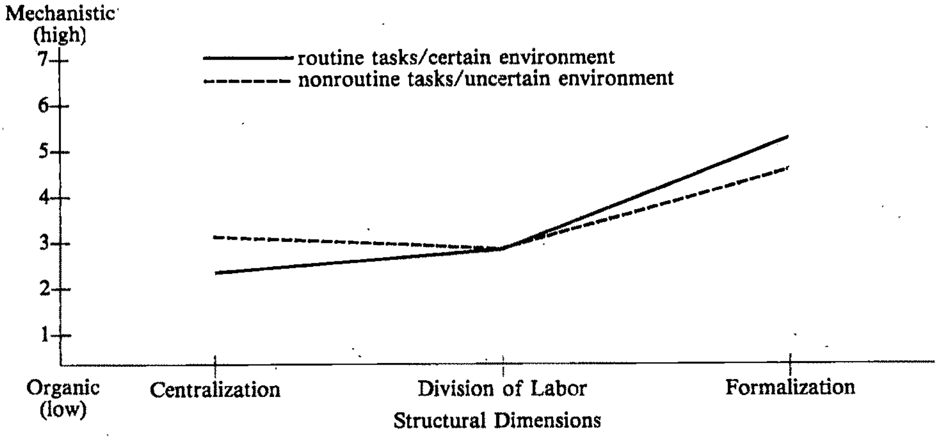
[a] The number of less effective work units = 8.

[b] The higher the number, the more mechanistic the dimension; the lower the number, the more organic the dimension.

[c] Significant at $p=.01$.

Results of the multiple comparisons analysis indicate that for the centralization and formalization dimensions there are significant differences (at the $p=.01$ level) and that the results for the centralization dimension again are in the opposite dimension from that predicted, that is, greater centralization is associated with nonroutine tasks and an uncertain environment. Figure 2 shows the structural profiles of less effective units in each situation.

Figure 2
Structural Profiles for Less Effective Work Units



Discussion

It was argued that to be effective a work unit that performed different kinds of tasks and dealt with certain and uncertain environments had to use different structures in the different situations it encountered. Thus, it was proposed that the same work unit used more than one structure and, further, that these structures were used simultaneously. The results of the data analysis support this general notion and thus suggest that the conventional notion of a single, relatively fixed work unit structure is inaccurate.

In general, supervisors evidently rely on multiple structures in order to carry out the different tasks of the work unit and to cope with the different environments they face. It is argued here, as does Child (1972a), that there is a need for greater focus on the role of the individual in making choices about the design of the organization. The findings here imply that supervisors make deliberate choices about the structures they use. Thus, it is important that one understand the basis on which supervisors make these choices. Many explanations exist, but the supervisor's use of a particular structure may depend on his personal preference for a particular structure or his perception of the fitness of his subordinates to make decisions, operate with loosely defined rules, or work on larger, more complex tasks. Future research, therefore, might take note of the maturity of subordinates—that is, their level of experience, motivation, and willingness to take responsibility—and the number of years subordinates have been in their present position. These characteristics relate to the extent to which supervisors will delegate decision making.

Multiple structures were found in both effective and less effective units. Thus the explanation for the differences in effectiveness of these units does not appear to rest solely on the basis of their using different structures in different situations. The results of the MANOVAs indicated that significant differences between structures used in more versus less effective units do not exist. The data do indicate, though, that on all dimensions, save formalization in uncertain situations, less effective units are more mechanistic than more effective units. This suggests that, in general, greater delegation of decision making and broader divisions of labor may contribute to a work unit's effectiveness. Because these results cannot determine causal direction, it also is possible that effective unit performance may stimulate the unit's supervisor to implement a more organic structure.

This study also examined the particular structures used in the different situations encountered within the same work unit. Centralization and formalization were expected to be organic in uncertain situations and mechanistic in certain situations, but the data show that these dimensions move in opposite directions. As the situation becomes more certain, for example, centralization of decision making decreases and formalization increases. These results, along with Child's (1972b) and Blau and Schoenherr's (1971), lend support to the thesis that control is a unitary dimension with two components, centralization and formalization, that vary inversely. Apparently, organizations rely on rules and procedures *or* centralized decision making to exert control; either may be used to regulate behavior.

But under what circumstances is it appropriate to impose formalized procedures and permit greater latitude in decision making or to centralize decision making and rely less on rules and procedures? Child (1972b) and Blau and Schoenherr (1971) do not address this issue, and the research that has examined the relationship between structure and context suggests that greater centralization of decision making *and* greater formalization of procedures are associated with certain environments or routine tasks (Burns & Stalker, 1961; Galbraith, 1977; Lawrence & Lorsch, 1969; Thompson, 1967; Tushman & Nadler, 1978; Woodward, 1965). The results here indicate that in more certain situations centralization is decreased and formalization, that is, the use of rules and procedures, is increased. Why should this occur?

Perhaps, in stable, routine situations the managers know what to expect because in all probability they have encountered the situation before. Consequently, it is possible for them to rely on established rules and procedures as guides for subordinates. By allowing subordinates to make their own decisions within these bounds, supervisors are able to "develop" their subordinates. Thus, decreased centralization may be used in these situations as a management development tool.

The findings of this research also indicate that increased centralization is associated with greater uncertainty. Bourgeois, McAllister, and Mitchell (1978) suggest that this may reflect the need on the part of the supervisor to structure or closely monitor uncertain situations and that such a response is "irrational" in that it may lead to less effective unit performance. The results of the present study, along with Tushman's (1979) and Morrow's (1981), indicate that increased centralization is associated with greater uncertainty in more effective units. This response may be an effective one because in nonroutine, uncertain situations there is a question about what action to take and about how to proceed. This lack of rules, procedures, and guidelines, that is, formalization, results in the need for greater information gathering and processing. Apparently supervisors respond to this situation by having subordinates gather and process information that is then passed on to the supervisor who makes a decision concerning what to do. In this way, the supervisor can rely on the expertise and knowledge of his subordinates, but he alone has an overview of the situation and retains the final say for himself.

In sum, this study points to the need for research that is sensitive to the use of multiple structures in work units. The continued reliance on the simplistic notion of homogeneous work unit structures can only inhibit understanding of the complex and dynamic process of designing organizations. In addition, the findings indicate that the most appropriate fit between a work unit's structure and its context is more than simply a function of the amount of uncertainty that is present. Other factors, such as the supervisor's need for control and maturity of subordinates, may have a significant impact as well. Finally, this study suggests that tasks and the environment influence different dimensions of structure. The results of this study are suggestive. It is clear that much more research into these issues is needed.

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INSIDE/OUTSIDE SUCCESSION AND ORGANIZATIONAL SIZE: THE PRAGMATICS OF EXECUTIVE REPLACEMENT

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One interesting aspect of administrative policy research on chief executive officers (CEO) concerns the implications of inside versus outside succession. Investigations considering the issue of successor type (Caplow, 1976; Carlson, 1961, 1962; Helmich, 1974, 1975, 1976a, 1976b; Helmich & Brown, 1972; Mace, 1977; Pfeffer, 1972; Salancik & Pfeffer, 1980) seem to reflect a common theme. It generally has been concluded that replacement of a CEO from within an organization represents a maintenance strategy. Outside successions, on the other hand, are associated with changes in existing patterns of administrative and resource allocations (Guest, 1962; Helmich, 1974, 1976b; Helmich & Brown, 1972; Lewin & Wolf, 1974; Pfeffer, 1981).

Succession Factors

The above observations are intuitively appealing, but the formula may be somewhat simplistic; it may be subject to attenuation by several succession factors that are logically related to organizational size. These factors may have a crucial impact on whether an inside or outside candidate will be selected. There are at least three such influences.

Potential Efficacy of Change Strategy. In the outside change view, there is an implicit assumption that an outside successor *could* initiate shifts in policy or embark on major transition programs for the organization. This assumption may be questionable, particularly in large organizations. Certainly, any radical change strategy—challenging in any case—would be more difficult in bigger firms. The sheer number of persons involved, the complexity of the organization, and a variety of vested interests both inside and outside the company represent potential constraints to successful change strategies. This may suggest that the occurrence of inside versus outside succession is affected by organizational size. Outsiders may be preferred when change is indicated *and* the changes are considered attainable. Consequently, outside choice may be more common for smaller firms facing turnaround-type interventions.

Candidate Qualification/Mobility. A major charter, and goal, of any organization is the training and development of its management. Here again, larger organizations may have an advantage. This advantage may translate into a propensity to prefer inside to outside successions. There may be two relevant tendencies to support this observation. First, larger organizations have greater opportunities to train and develop top management. Competent managers can be moved easily between line and staff, from division to division, and to positions of greater responsibility. This alone suggests that when succession becomes necessary, the larger organization may have more qualified, experienced candidates in place.

Beyond executive development, the second issue involves the potential for placing competent executives. Larger companies have, and often create (e.g., through merger and/or acquisition) promotional opportunities. In smaller organizations, competent managers may not have the patience to let death and retirement create opportunities for more responsibility. In order to move up, these managers must move out. Even if smaller organizations have qualified managers, they may lose them to larger firms in which the opportunities for advancement are greater. On the other hand, qualified managers in larger organizations may be more inclined to stay because of the promotional opportunities within the company.

In sum, larger organizations are more likely to have more qualified top-management prospects as a function of their training edge and also the ability to retain this talent through internal opportunity. At a minimum, larger organizations have more options with respect to inside/outside selection. In instances of succession, then, the larger firm may have a decided preference for insiders. Having been trained within the organization, these individuals may be the first choice; they presumably are more familiar with internal operations.

Internal Power Structure. Ideally, those responsible for selecting a replacement would do so based on the needs of the organization and the qualifications of the candidate. This, while commendable, may be a naive view. Administrative succession probably is more reasonably framed as a political process of contest capability resolved by subunit power (Pfeffer & Salancik, 1978). Pfeffer and Salancik note that executive turnover should be related to the stability and/or problems confronting an organization. Beyond that, the choice of CEO should be systematically related to an organization's requirement for dealing with critical constituencies. To the extent that a CEO has institutionalized power, however, the relationship between context and selection will be attenuated.

Pfeffer and Salancik's discussion is focused on executive turnover and those factors that may operate to prevent the replacement of a CEO. This analysis, however, is extended easily to include those who are in line as CEO replacements. If there are inside candidates powerfully entrenched in the organization, there may be a concomitant tendency to choose an inside member.

This "entrenchment" may be at least partially a function of organization size as well. The internal structures of larger firms may be more firmly set, with coalitions in place. Larger, more institutionalized firms, then, may have relatively higher rates of internal succession.

In summary, there may be several factors that affect the inside-outside choice. These factors seem to be logically related to size. In every case, there is a reasonable expectation that larger firms, for a variety of reasons, would be more likely to experience inside succession. This may not necessarily be a function of pure choice based on organizational needs and candidate qualifications. Rather, it may be a function of the influences affecting that choice.

Hypotheses

The analytical question concerns the association, if any, between organizational size and the incidence of inside versus outside succession.

H1: There will be a greater incidence of inside succession in larger organizations.

Although this is a testable proposition, it may be that attenuating effects of size on executive succession could be demonstrated only within a reasonable range—one within which companies can be considered acceptably size-homogeneous. To attempt a comparison of a typical New York Stock Exchange (NYSE) company, for example, and a company trading on the over-the-counter market may be well outside this range. A second hypothesis therefore is suggested.

H2: Companies on the NYSE will have a greater incidence of inside succession than non-NYSE companies.

This hypothesis relies on an assumption that presence on different exchanges provides some evidence of size heterogeneity. This assumption seems reasonable, given the vast differences in average size between NYSE companies (sales—$1.25 billion; employees—15,954) and non-NYSE companies (sales—$109 million; employees—2,411) for this sample.

Method

Sample. The population is comprised of all companies reported to have experienced executive succession over a year's period on the NYSE, the American Stock Exchange, and over-the-counter market listed by the National Association of Securities Dealers (NASD). This information was derived from daily reports of these activities in the *Wall Street Journal* and confirmed by corporate 8K reports. Only the CEO successions of parent companies were considered.

Data, Measurement, and Analysis. The relevant variables in this investigation are inside/outside succession and size of the firm. The coding of successor type is binary. An inside successor is a person promoted from within the executive span of the predecessor; and outside succession occurs when the newly appointed CEO was not in the predecessor's span (Helmich, 1974, 1975, 1976a, 1976b).

Organizational size presents a potential problem. There has been controversy regarding the appropriateness, dimensionality, and psychometric properties of common size metrics (Gupta, 1980; Kimberly, 1976). Agarwal (1979), however, having demonstrated that common size measures (e.g., sales and number of employees) are highly associated and proportional, argues that the measures essentially are interchangeable. Given these disparate positions, multiple measures of size will be used. Accordingly, both number of employees and sales will be relied on as size metrics. These size data for succession companies were collected from *Standard and Poor's Register of Corporations* (1980). Because of the extreme skewness typically encountered, all size data were subjected to logarthimic (base-10) transformation for analysis.

Results

The frequencies of outside succession are contained in Table 1. For the population in this study ($N=181$), outside succession amounted to 23.2 percent. The first hypothesis, that larger organization size would be associated with greater incidence of inside succession, received relatively strong support (Table 1). These results are consistent whether considering number of employees ($r=.38$; $p<.001$) or sales ($r=.33$; $p<.001$) as a size metric. Notice, also, in Table 1 that the association between the size metrics is $r=.78$ ($p<.001$). For comparative purposes, Table 1 includes associative analyses for NYSE ($r=.23, p<.01$; $r=.25, p<.01$) and non-NYSE ($r=.40, p<.001$; $r=.24, p<.01$) for number of employees and total sales, respectively. The results are consistent throughout; larger firm size (irrespective of exchange or size metric) is associated with greater inside succession.

Table 1
Frequencies and Associations (r): Organizational Size and Inside/Outside Succession

	Inside/Outside Succession		
	All Companies (N=181)	*New York Stock Exchange (N=103)*	*Non-New York Stock Exchange (N=78)*
Frequency of outside succession (%)	23.2	14.6	34.6
Number of employees[a]	.38***	.23**	.40*
Total sales[a]	.33***	.25**	.24*
Size metric intercorrelation	.78***	.76***	.69***

[a] Positive coefficients indicate greater incidence of inside succession.
*$p<.05$
**$p<.01$
***$p<.001$

Although the correlational analysis is appropriate, it may not capture the magnitude of the relationship between types of succession and organization size. Table 2 illustrates that by splitting the succession population at the median, smaller companies are more than twice as likely (32.2 percent vs. 14.3 percent; $p<.01$) to experience outside succession. Table 2 also provides median split analyses for the individual exchanges. Once again, the results are consistent; smaller firms are more than twice as likely to

Table 2
Median Split Analyses: Organizational Size and Outside Succession[a]

	Inside/Outside Succession		
	All Companies (N=181)	*New York Stock Exchange (N=103)*	*Non-New York Stock Exchange (N=78)*
Frequency of outside succession	23.2	14.6	34.6
>Median[b]	14.3	9.6	22.5
<Median[b]	32.2**	19.6**	47.4*

[a] All entries represent percentage (%) of inside succession.
[b] Median split based on total sales metric.
$^{*}p<.05$
$^{**}p<.01$

engage in outside succession whether on the NYSE (19.6 percent vs. 9.6 percent; $p<.01$) or non-NYSE (47.4 percent vs. 22.5 percent; $p<.01$).

The second hypothesis is designed to test the proposition that NYSE companies will have a greater incidence of inside succession than non-NYSE firms. Once again, this hypothesis is strongly supported. A chi-square analysis clearly demonstrates that NYSE companies are less than half as likely (14.5 percent vs. 34.6 percent; $p<.001$) to experience outside succession.

Discussion

It has been suggested that from the onset of a replacement decision, there may be a reluctance to go outside the organization for a CEO. Drucker observes, somewhat harshly, that "it is an admission of bankruptcy for a big business to have to go on the outside to recruit into top management. It is also a desperate gamble" (1974, p. 662). Others are less emphatic but agree that outside succession is risky at best and disruptive (Allen, Panian, & Lotz, 1979; Helmich, 1976a; Mace, 1977).

Despite this reluctance, outside successions are not uncommon. Although inside successions certainly are the "rule," outside successions were reported nearly 25 percent of the time for this population. Outside successions apparently are somewhat unusual in NYSE companies (14.6 percent). They are more commonplace (34.6 percent) in non-NYSE firms.

The results of this paper suggest that the choice of inside versus outside succession may be, at least in part, a function of organizational size. This has been empirically demonstrated at several levels and across multiple size indices. Smaller firms, whether partitioned by total sales, number of employees, or by exchange (NYSE vs. non-NYSE), are more than twice as likely to experience outside executive succession.

Exactly what factors account for these large differences remain to be determined. It has been speculated that larger organizations may have several characteristics that may impede the selection of outside successors, even when such a change may be indicated.

There may be a prejudice, for example, that because of its relative complexity a large organization would be very difficult to turn around even if an outsider were chosen. Also, larger organizations may have a distinct edge in executive development and the potential for executive mobility. This may lend to the apparent propensity for larger organizations to choose insiders. Lastly, the internal power structure of larger organizations may lead to a certain "entrenchment" of interested parties who may have the wherewithal to encourage—if not demand—inside replacement.

CEO succession is not a rare event. A recent report on 2,000 leading industrials and 300 major service organizations indicated that 45 percent of current CEOs have held their position for 5 years or less (Heidrick & Struggles, 1980). Given the potentially enormous impact of a CEO replacement, it would seem that the interactive effects of organizational size, executive replacement, and inside/outside succession may be fruitful areas of future research.

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COMMUNICATORS AND INNOVATORS IN RESEARCH AND DEVELOPMENT ORGANIZATIONS[1]

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Prior research has shown that individual communication roles are critical to the understanding of how information enters the research and development (R&D) organization, is diffused within the organization, and then transformed into innovations. These roles usually emerge from the interactions among professional employees rather than having been planned, formal roles. This research has indicated that a minority of professional employees, often called communicators, account for a majority of the information brought into and diffused throughout the organization. Communicators are well connected to information sources outside and inside the organization. In addition, a minority of professional employees, often called innovators, produce a majority of the innovative technological outputs such as new patents, products, or processes that are generated by the R&D organization. These two roles, moreover, have been found to have a high degree of overlap in the prior research in that most of the communicators also will be innovators, and vice versa (Allen, 1977; Pelz & Andrews, 1976; Tushman & Nadler, 1981; Tushman & Scanlan, 1981b).

The existing literature on innovators indicates that they tend to possess the following individual characteristics: high competence, diverse work interests and duties, self-confidence, tolerance for ambiguity, and a belief that they are creative (Barron & Harrington, 1981; Maddi, 1976; Pelz & Andrews, 1976). Less literature exists on the individual characteristics of communicators; however, they have been found to be technically competent; above the norm in the amount of scientific, technological, and work related material they read, as well as the number of personal contacts they have; flexible in self-presentation; and often in supervisory positions (Allen, 1977; Jervis, 1975; Tushman & Scanlan, 1981a).

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Communicators and innovators often are found in networks with unequal numbers of communicators and innovators grouped across a network. Centrality within a network refers to the degree of access one has to the flows of information compared to others. Such networks can contain: close groupings of high prestige communicators and innovators who are highly central to information flows and who communicate quite frequently; less well socially-connected professionals who are less central to information flows and who communicate less frequently; and isolates who have only limited contact with others in the network and hence are the least central to information flows. The patterns of interactions among members of these communication networks and their centralities also have been suggested to be rather stable over time (Allen, 1977; Katz, 1982; Moxley & Moxley, 1974; Schwartz & Jacobson, 1977).

Granovetter (1973) suggested that strong ties among a small number of professionals actually can hinder the diffusion of information throughout the total network. A strong tie means mutual sociometric choices among a small number of people; a weak tie has only a one-way or indirect sociometric choice connection. "The strength of weak ties" allows those in weak small groupings to communicate across groups to the majority of network members. Strong ties breed local cohesion and a fragmentation of the total network into strong small groupings from which information is not diffused. To Granovetter, weak ties are necessary for the integration of the entire network into the organization's task. Flament (1963) has proposed the related concept of a strong component that is particularly useful for the study of communication networks. A strong component (strongly connected) is a communication network in which all members are mutually reachable such that a potential exists for information to be transmitted between any two members of a strong component. Communications between any two members of a strong component need not be direct, but the members do share a stronger degree of connectivity than do those outside a strong component. Thus, a strong tie is basically a dyadic or triadic level concept, and a strong component is a concept generally applied to a communication network. At present, it is not known whether the existence of strong components has the same potentially dysfunctional effects on the diffusion of information in a network as those suggested by Granovetter for strong ties.

Allen's (1977) literature review and research results indicate that the physical propinquity (nearness of desk location) of communicators, innovators, and other R&D professionals has a strong influence on their groupings. Although not explicitly considered by them, the concepts of Granovetter (1973) and Flament (1963), and Allen's research logically suggest that physical propinquity among the members of a communication network will positively affect the development of strong components.

The purpose of the present research was to investigate communicators and innovators in R&D organizations. R&D organizations were chosen for this research because the communication and transformation of scientific and technological information into innovations is their basic mission. Two basic research questions that remain unanswered in the prior literature were the focus of this study:

Research Question 1. Will communicators and innovators have distinctive individual characteristics and information processing habits? Namely, will self-esteem, low need for clarity, an innovative orientation, technical competence, high degree of reading, centrality in a network, and supervisory duties hallmark communicators and innovators?

Research Question 2. Will physical propinquity be positively related to the formation of strong components among communicators, innovators and other professional employees?

Method

Subjects. Professional employees from three applied R&D organizations located in the southwestern United States participated in the research. Organization A was the R&D laboratory for a large manufacturer of capital equipment for the petroleum industry. The other two organizations were departments of a large governmental R&D complex. Organization B developed computer software systems for use in aerospace projects. Organization C developed power and propulsion systems for aerospace vehicles. The three organizations were chosen to represent a range of different applied R&D activities.

Data were collected twice with a time lag of one year to allow sufficient time for changes in communication patterns and innovation to occur. At time one, 256 professional employees participated, which consisted of 91 percent of the target population in the three organizations. At time two, 236 professional employees participated, which represented 90 percent of the time two target population. A sample of 208 professional employees (81 percent of time one) participated at both time one and time two. Of the sample, 89 percent were male. The participants had an average age of 40 years and had been in their present position for an average of 6 years. Almost all of the subjects held a bachelor's degree, and most of them had taken some graduate education.

Measures. Communication of scientific and technological information was measured by peer nomination (sociometric choice). This type of information has been found to be the most important raw material for R&D work and the generation of innovations (Allen, 1977; Pelz & Andrews, 1976).

Each subject was asked to nominate up to four co-workers to whom he or she went for scientific and technological information. The number of nominations received by each individual became the communication score for that person. Peer nomination has been shown to be a reliable and valid measure of organizational variables (Kane & Lawler, 1978; Love, 1981).

Innovation was measured by one subjective indicator and two objective indicators. Management rank-ordered their professional employees on the basis of who had contributed most to important innovations in the respective organizations. Based on Zaltman, Duncan, and Holbek (1973), the questionnaire defined an innovation as an important product or process, or idea leading to a new or improved product, that is new to your organization. Illustrative examples were given for each organization to ensure that a common concept of innovation was understood. Total number of patents and total number of publications for each subject also were obtained as objective indicators of innovation.

Personality characteristics were measured by the following three instruments—with reliabilities (coefficient alpha) for the present sample given in parentheses: (a) self-esteem (.86) was measured by the 10-item Rosenberg (1965) scale; (b) need for clarity (.82) was measured by the 6-item scale developed by Ivancevich and Donnelly (1974); (c) innovative orientation (.88) was measured by the Kirton (1976) adaption-innovative inventory, which had 32 items. A high score indicated an innovation orientation, or an ability to "do things differently." A low score indicated an adaptive orientation, or an ability to "do things better."

The following demographic characteristics also were obtained: age, education, job level, and total number of work-related journals and periodicals regularly read. Physical propinquity was measured by the distance in walking yards from one's primary work station to each of three individuals who were the most valuable sources of work-related information for each subject (Allen, 1977).

Procedure. The research questionnaires were completed twice (one year apart) in groups of approximately 30 subjects each at the respective organizations. Management ratings and peer nominations also were obtained at these times.

Results

A preliminary analysis showed that frequency distributions for peer nominations of communication and for patents and publications were substantially skewed such that a minority of the professional employees accounted for a majority of the communication nominations, patents, or publications, as has been found in the prior literature. A correlational analysis showed stable patterns of interaction between communicators and innovators over time and a substantial degree of overlap between the two roles such that communicators also tended to be innovators, and vice versa, as has been found in prior research.

Table 1
Individual Characteristics Means by Communicator/Innovator Groups[a]

	Communicator/Innovator Group[b]				
Variables	*Low (G1)*	*Medium (G2)*	*High (G3)*	*F*	*Differences from Scheffé Test*
Self-esteem	39.66	43.41	44.71	4.62**	G3>G1
	(40.27)	(41.97)	(44.00)	(3.93*)	(G3>G1)
Need for clarity	21.51	19.99	16.61	23.52***	G1>G2>G3
	(22.03)	(19.02)	(16.30)	(24.15***)	(G1>G2>G3)
Innovative orientation	92.16	98.75	106.71	18.41***	G3>G2>G1
	(93.34)	(99.59)	(105.63)	(16.81***)	(G3>G2>G1)
Patents	.08	.18	1.30	8.90***	G3>G2>G1
	(.06)	(.21)	(1.22)	(7.87***)	(G3>G2>G1)
Publications	1.50	3.63	5.10	3.30*	G3>G1
	(1.54)	(3.87)	(4.94)	(3.01*)	(G3>G1)
Education	3.11	3.72	3.92	6.17**	G3, G2>G1
	(3.18)	(3.81)	(3.88)	(5.87**)	(G3, G2>G1)
Periodicals read	2.88	3.48	3.61	6.93***	G3, G2>G1
	(2.91)	(3.53)	(3.52)	(6.03**)	(G3, G2>G1)
Job level	1.10	1.49	1.80	14.54***	G3>G2>G1
	(1.09)	(1.46)	(1.83)	(15.26***)	(G3>G2>G1)
Centrality	10.37	16.50	19.35	18.16***	G3>G2>G1
	(12.61)	(16.06)	(18.79)	(15.73***)	(G3>G2>G1)

[a] Time 1 data are on top and time 2 data are on bottom in parentheses. Time 1 *ns* = 86, 85, and 85 for groups G1, G2, and G3, respectively. Time 2 *ns* = 79, 79, and 78 for groups G1, G2, and G3, respectively.

[b] Groupings resulted from trichotomization of composite variable which consisted of peer nominations received as a source of scientific and technological information and management ratings of innovation. Communicators/innovators are in G3.

*$p<.05$

**$p<.01$

***$p<.001$

The first research question asked if communicators and innovators would have distinctive individual characteristics and information processing habits. Because of the substantial overlap in these two roles, a composite variable was constructed that consisted of a linear combination of peer nominations received for scientific and technological information communication and management ratings of innovation. This composite variable of communicator/innovator was trichotomized; Table 1 provides a series of one way analysis of variance and Scheffé tests across the three groupings on individual characteristics for time 1 and time 2. Moxley and Moxley's (1974) adjusted index of centrality also was computed from the peer nominations. These results suggest that communicators/innovators had an innovative orientation whereby they wanted to "do things differently," a low need for clarity, and high self-esteem. In addition, they tended to have a higher level of education, to read more work related journals and periodicals, to be in supervisory positions (job level), and to be more central in communication networks. The first research question therefore was answered affirmatively.

The second research question asked if physical propinquity would be positively related to the formation of strong components among communicators, innovators, and other professional employees. Based on Flament (1963)

Table 2
Means of Walking Yards to Information Sources by Sociometric Category for Time 2 Data[a]

	1 or No Connections (G1)	*Outside Strong Component (G2)*	*Inside Strong Component (G3)*	*F*	*Differences from Scheffé Test*
First information source	25.89	24.19	17.38	8.73**	G1, G2>G3
Second information source	33.35	31.56	28.60	6.51*	G1, G2>G3
Third information source	54.62	49.73	29.81	15.40**	G1>G2>G3

[a] *N*s=47, 48, and 141 for groups G1, G2 and G3, respectively.
*$p<.01$
**$p<.001$

and Allen (1977), a strong component is a network in which all members are mutually reachable; hence a potential exists for information to be transmitted between any two members of a strong component. A preliminary sociogram for each organization was constructed based on the peer nominations for communication, and those who were mutually reachable (even if indirectly) were grouped into a strong component. To answer the second research question the subjects were grouped into three categories: (G1) those who had only one or no connection with others in this organization, (G2) those with more than one connection but who were outside a strong component, and (G3) those who were inside a strong component. The means for walking yards to the three most important sources of information as reported by the subjects in the three categories are reported in Table 2, along with one way analysis of variance and Scheffé tests. The results indicate that physical propinquity to information sources was greatest (i.e., less walking yards) for those in a strong component. That is, the formation of strong components among communicators, innovators, and other professional employees and physical propinquity were positively related. Hence, the second research question was answered affirmatively.

Discussion

The two research questions of this study were answered affirmatively by the results. Communicators/innovators were distinguished by an innovative orientation, low need for clarity, high self-esteem, more formal education, a high degree of reading, supervisory duties, and centrality in communication networks. In addition, physical propinquity was associated with the formation of strong components among communicators, innovators, and other professional employees.

Becker (1970) has noted three reasons why centrality in a social network can be associated with communication and innovation: (a) central professionals can obtain more information than others; (b) the information from others can provide legitimation and support for an innovation; and (c) central professionals can be given more deliberate influence attempts to accept or reject an innovation. The results of the present study would suggest that communicators/innovators in R&D organizations also tend to have certain personality characteristics, such as an innovative orientation, a low need for clarity, and high self-esteem, that enhance their ability to take risks and to innovate. Their higher level in the organization, more education, and greater degree of reading also suggest that they have obtained information and power through multiple means. As suggested by Becker, others in the networks often may wait for communicators/innovators to demonstrate the feasibility of a risky innovation first before they will accept it. Perhaps the prestige of the communicators/innovators allows them to take risks that others are reluctant to take.

It is important to note that the communication networks studied in the present research were emergent rather than intended networks. That is, the networks and the relations among their members resulted from the day-to-day interactions of the R&D professionals rather than from an intended management design. Whether a formalization of this emergent structure or an intentional manipulation of a variable could result in improved innovation generation is an important and open question. Can and/or should management formalize communicator or innovator roles? Should management only provide the proper conditions for communication and innovation to occur and then let networks emerge by themselves? Very little research exists on these questions, and they certainly deserve high priorities for future research.

The present and prior research does suggest, however, that the physical layout of offices in an R&D organization can be a variable that management can and should affect. The research suggests that allowing for short distances to important information sources and enhancing informal meetings through the clustering of offices, common lounge areas, eating places, and so on can increase scientific and technological information diffusion throughout the R&D organization. Perhaps the strong ties that Granovetter (1973) saw as inhibiting communciation diffusion develop because of an uneven distribution of physical propinquities among professional employees that may result in strong components and isolates. A more even distribution of physical propinquities may enhance the development of weak ties with a more equal opportunity for everyone to share in important communications. Additional research on what happens to communications when physical propinquity is altered is clearly warranted.

It should be noted that the present research was conducted with applied R&D organizations; the development of communicator/innovator roles may not occur in the same fashion in basic research organizations in which "two-step" communication flows may be less common (Katz, 1982). With widespread direct contact with external sources of information, the development of communication networks in basic research organizations may be different. It may be more reflective of an "invisible college" (Crane, 1972) of colleagues from a number of organizations, and thus the specialization in communication roles in the form of communicators/innovators would not be expected to emerge. Differences in the emergence of communicator and innovator roles by type of R&D is another area of importance for future research.

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In order to be considered, your submission *must* follow these rules:

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(c) A separate abstract page on each paper or symposium should report the title and an abstract of no longer than 100 words.
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SPECIAL INSTRUCTIONS FOR PROFESSIONAL DIVISIONS AND INTEREST GROUPS

BUSINESS POLICY AND PLANNING

The division invites submission of papers and symposia covering empirical research, concept and theory development, and teaching concerns on all aspects of business policy and planning. An award will be given for the best competitive paper. The submission of doctoral dissertations to be considered for two cash awards is also encouraged. **David B. Jemison**, Graduate School of Business, Stanford University, Stanford, CA 94305. (415)497-4371 (office); (415)856-9145 (home).

HEALTH CARE ADMINISTRATION

The division invites papers and symposia on health care related issues. Manuscripts and symposia examining health care constructs and/or samples of an individual, organizational, policy, etc., nature are welcome. Data and non-data based paper are appropriate. An award of $250 will be given for the outstanding paper. **Michael A. Abelson**, Department of Management, Texas A&M University, College Station, TX 77843. (409)845-4851/3686 (office); (409)696-8897 (home).

INTERNATIONAL MANAGEMENT

The field of management faces a major challenge due to growing interdependence among economic societies of the world. Survival and growth of business firms will depend upon our ability to accurately comprehend the nature of interdependence, its impact on business organizations, and the quality of managerial response to this new international reality. The International Management Division invites papers, panel proposals, and innovative program ideas to meet this challenge. **Bhal J. Bhatt**, College of Business Administration, 2801 West Bancroft Avenue, University of Toledo, Toledo, OH 43606. (419)537-2969 (office); (419)882-7950 (home).

MANAGEMENT EDUCATION AND DEVELOPMENT

The division invites papers and proposals for symposia, workshops, and tutorial sessions on all aspects of management education and development. Contributions are particularly encouraged in three areas: (1) workshops and tutorials that demonstrate the effective and/or innovative application of an instructional method or technology, (2) empirically-based papers, and (3) papers and symposia that focus on management education issues in business and related organizations. A cash award is presented to the best competitive paper. **Bill Heisler**, Management Development Center, Newport News Shipbuilding, 4101 Washington Avenue, Newport News, VA 23607. (804)380-2681 (office); (804)874-4018 (home).

MANAGEMENT HISTORY

MH invites creative papers, symposia and panel proposals. We particularly encourage not only traditional management history but also those using historical perspectives or methods to illuminate other management topics. Contemporary organization histories, oral history and historical contexts for current issues are all possibilities. Preference will be given to unusual or cross-disciplinary pieces and to papers demonstrating the contemporary relevance of history to organization studies or management. **Mariann (Sam) Jelinek**, School of Business, SUNY-Albany, 1400 Washington Avenue, Albany, NY 12222. (518)457-8506 (office); (518)456-6441 (home).

MANAGERIAL CONSULTATION

Papers and symposia proposals related to the consulting process are invited. Especially appropriate are conceptual, research, and applications-based submissions highlighting interdisciplinary approaches and integrations of theory into practice. Three hundred dollars ($300) will be awarded for the best paper. **Linda M. Calvert**, School of Business, University of Houston–Clear Lake, 2700 Bay Area Boulevard, Houston, TX 77058. (713)488-9420 (office); (713)334-1322 (home).

ORGANIZATION AND MANAGEMENT THEORY

The division seeks papers and symposia that contribute to developing theory and research in organization and management. Suggestions for symposia are requested by November 1, 1983. Symposia chairs will be asked to review competitive papers for their topics. Emphasis will be on junior faculty submissions and empirical in-progress work. Recognition awards will be given for the best competitive paper and the best paper based on a dissertation. Eligible papers must be identified as being based on a dissertation. **Gerald R. Salancik**, Department of Business Administration, 1206 South Sixth Street, University of Illinois, Champaign, IL 61820. (217)333-4240 (office); (217)352-3368 (home).

ORGANIZATIONAL BEHAVIOR

The division invites submission of papers and symposia that contribute to the development of theory and research in organizational behavior. Submissions that focus on problems of current relevance to organizations are strongly encouraged. Two recognition awards will be given by the division: one for the best competitive paper (may be coauthored) and one for the best competitive paper based on a dissertation (dissertation must not be coauthored and should be clearly identified as a dissertation at the time of submission). **Daniel R. Ilgen**, Department of Management, Michigan State University, East Lansing, MI 48864. (517)355-5415 (office); (517)349-3913 (home).

ORGANIZATIONAL COMMUNICATION

Research, conceptual, and theory papers, as well as symposia, are invited. Topics may include, but are not limited to: communication policy/strategy, networks, feedback, negotiation, boundary spanning, and information systems. In addition, specific applications of communication concepts and theory to real world organizational problems are encouraged. The author(s) of the best paper will receive an award in recognition of superior scholarship. **Susan Hellweg**, Department of Speech Communication, San Diego State University, San Diego, CA 92182-0300. (619)265-5124 (office); (619)462-2289 (home).

ORGANIZATIONAL DEVELOPMENT

Papers, symposia, and one-day workshop proposals are invited on all aspects of organization development. Presentations that develop theory, research, and practice relevant to industrial revitalization, environmental turbulence and dependence management, effective service organizations, multicultural cooperation, and large-scale social problem solving are encouraged. Symposia that present multiple perspectives (conceptual, ideological, experiential) on a common topic or innovative integrations of theory, research, and practice will be welcomed. **L. David Brown**, School of Management, Boston University, 621 Commonwealth Avenue, Boston, MA 02215. (617)353-4159 (office); (617)731-6712 (home).

PERSONNEL/HUMAN RESOURCES

Papers and symposia are invited on all employment topics. Empirical, conceptual, and literature reviews of the impacts of personnel/human resource activities on individuals, jobs, and organizations are appropriate. These include, but are not limited to, topics such as human resources planning, performance appraisal, selection, training and development, motivation, compensation and benefits, and labor relations. Doctoral student papers are encouraged. A $200 price is awarded for the best competitive paper. **Marc J. Wallace, Jr.**, Department of Management, College of Business and Economics, University of Kentucky, Lexington, KY 40506. (606)257-2962 (office); (606)272-4926 (home).

PRODUCTION/OPERATIONS MANAGEMENT

State-of-the-art "think" pieces on management issues or problems in the P/OM areas are invited. Competitive papers, research-in-progress and proposals for symposia, tutorials, and workshops which integrate P/OM with the other divisions are of particular interest. Some possible topics are: research and development in robotics, the management of technology, the operations management/business policy interface and technology advances in the P/OM classroom. **Kathleen A. Johnson**, School of Business, University of Louisville, Louisville, KY 40292. (502)588-7830 (office); (502)637-1152 (home).

PUBLIC SECTOR

Papers on management or policy analysis issues in public, quasipublic, and not-for-profit sectors are welcome. In addition, studies comparing structural, environmental, and technological variables for organizations in these sectors versus the private sector are welcome. A $100 prize will be awarded for the best competitive paper. **Barry Bozeman**, The Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, NY 13210. (315)423-3706 (office); (315)423-4000 (message).

SOCIAL ISSUES

Papers and symposia are invited on all aspects of corporate social responsiveness. Empirically-based studies of the environment and the measurement and management of corporate social performance are especially encouraged. A special session will be devoted to recently completed doctoral research. Awards will be presented to the best research paper and the best doctoral dissertation. **Frederick D. Sturdivant**, College of Administrative Science, Ohio State University, Columbus, OH 43210. (614)422-2039 (office).

CAREERS

We invite papers, symposia, panels and workshops on theory, research and practice in the career development and management field. Topics are solicited at individual, organizational or societal levels of analysis. We also encourage submissions which attend to the relationships between these separate levels of analysis and which connect the study of careers to other aspects of management activity. Topics may include, but are not limited to, tests of theoretical frameworks, evaluations of field interventions, and integration of career theories. **Jeffrey Sonnenfeld**, Baker 109, Harvard Business School, Boston, MA 02163. (617)495-6485 (office); (617)492-6950 (home).

ENTREPRENEURSHIP

The interest group invites submissions of papers and symposia dealing with entrepreneurship. Papers describing empirical research are especially encouraged. Submission of doctoral dissertations for a cash award is also invited. **William B. Gartner**, Center for Entrepreneurial Studies, McIntire School of Commerce, Monroe Hall, University of Virginia, Charlottesville, VA 22903. (804)924-3214 (office); (804)979-8692 (home).

R&D/TECHNOLOGY/INNOVATION

This interest group invites papers and symposia on all aspects of R&D/Technology/Innovation management. Papers addressing innovation in various types of organizations, technology transfer, R&D personnel, careers and organizations are welcome. **Michael Tushman**, 719 Uris Hall, Graduate School of Business, Columbia University, New York, NY 10027. (212)280-4271 (office); (914)723-8207 (home).

WOMEN IN MANAGEMENT

Papers and symposia proposals are invited which examine significant issues facing women in organizations and/or examine sex differences in organizations. Theoretical papers and empirical studies which advance theory are both encouraged. The Dorothy Harlow Distinguished Paper Award will be presented to the best competitive paper advancing knowledge on women in management. **Sara M. Freedman**, Department of Management, College of Business Administration, University of Houston, Houston, TX 77004. (713)749-3766 (office); (713)488-4687 (home).

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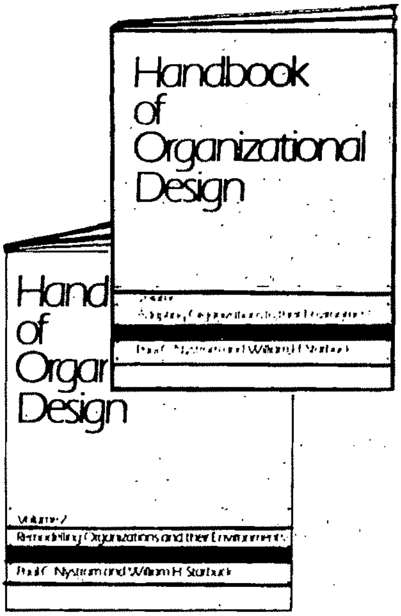
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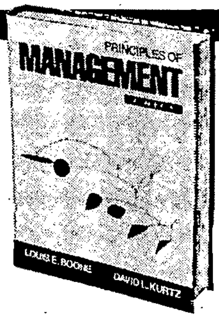

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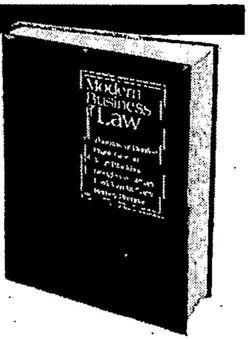

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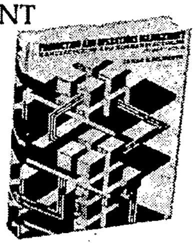

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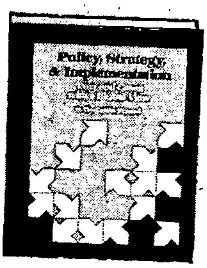

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